

# Contractors and Engineers Monthly

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## PICKS and SHOVELS

By O. E. POTTER

### McAdam and His Roads

Just one hundred years ago there went out of this world a man whose interest, as a private citizen, in the roads of his community did much to determine the history of transportation. In the hundred years which have since passed, the world has marched forward over increasingly improved roadways because John Loudon McAdam had the courage of his convictions and the public spirit to devote his time and his fortune to prove he was right.

This man McAdam, who was born in Ayr, Scotland in 1756, was a canny Scot who amassed a considerable fortune in his uncle's counting house in New York City. In 1783 he returned to Scotland, purchased an estate at Saubrie, Ayrshire and settled down to the life of a country squire. At that time the roads of Scotland and Great Britain, as well as the rest of the world, were in a deplorable state and McAdam, who was a road trustee in his district, at once began to consider how to improve them. That his interest in roads was not an entirely new one is evidenced by the fact that while he was still in school he constructed what he considered a model road section.

The trend of the times was to construct carriages and coaches which were suitable to the roads, not to construct roads for the vehicles which would travel over them. In an article "The Nation's Debt to McAdam" in a recent issue of *The Municipal Journal & Public Works Engineer* of Great Britain, it is pointed out that Select Committees of Parliament were appointed "to take into consideration the Acts now in force regarding the use of broad wheels, and to examine what shape is best calculated

(Continued on page 35)

## Coming Snow Drifts Can Be Stopped Now

Well-Designed Highways and Natural and Artificial Barriers to Control Drifts Are Half the Battle

(Photo on page 40)

**S**NOW drift control has been the subject of extensive research for the past several years at the Engineering Experiment Station of Michigan State College. In 1934 the results of the investigation on artificial snow fences were published in Bulletin No. 57 and a study is now being made on natural snow fences.

Snow drifts are caused by the deposit of wind-borne snow. Some of the snow is carried by the wind as it falls, but greater amounts are picked up by the wind and carried along the surface of the ground. When the velocity of the wind is not strong enough to carry the snow particles in suspension, they are dropped to form a drift. Any barrier that will slow down the normal velocity of the wind will cause a drift to form.

The largest amount of snow will be deposited at a certain point whose distance from the barrier depends upon the velocity of the wind, the tightness of the barrier, the height of the barrier and the density and texture of the snow.

In a paper on snow drift control presented at the annual meeting of the American Society of Civil Engineers in 1935.

(Continued on page 12)

## Storm Water Channel Built in Los Angeles To Prevent Floods

(Photos on page 40)

**T**HREE areas of operation surrounding the City of Los Angeles comprise the great project being rushed to completion by the U.S. Engineer Department for the protection of the southern California metropolis from future floods. With extensive use of hand labor wherever possible these projects have absorbed large numbers from the relief rolls, thus performing two useful purposes. A fourth area north of Santa Monica on the coast includes three large quarries where stone for shore protection and stream revetment is produced also with relief labor.

The upper Ballona Creek Project is typical of the flood control work in this district. It consists of 9,300 feet of reinforced concrete channel varying in width from 39 feet to 77 feet and with wall heights of from 12 feet 9 inches to 17 feet. About 45,000 cubic yards of concrete are required for the job. At street intersections, intermediate walls and cover slab which serves as a bridge. Here the wall height is increased by about 4 feet. Provision is made for future extension of the outside walls and keyways are provided for future con-

### Concrete Structure to be Covered Later to Provide New Boulevard for Highway Traffic

struction of the interior walls throughout the length in order that cover slab may be added to carry street traffic along the entire project.

The existing creek had been excavated at least twice prior to the beginning of this project, thus reducing the volume of excavation necessary by machine. Narrow right-of-way, necessitating almost vertical banks, the proximity of dwellings to some parts of the work, ground water slightly above the invert grade, artesian wells within or immediately outside the completed structure, and numerous crossings of the line of the project by sewers and water lines all complicated the work.

### Excavation

Approximately 400,000 cubic yards of material was involved in the excavation along the line of the drainage project. The old drainage ditch had to be widened and the bottom dropped about 5 feet. The material was adobe at the top changing to fine and then coarse sand at the bottom of the trench. The machine excavation equipment consisted of a P & H dragline with a 2-yard bucket, supplemented when necessary by a rented dragline.

Several sewers in various locations caused some trouble in relocation and carrying them alongside or under the new channel. One 8-inch sewer was carried on a bench along the trench and the manholes built before the excavation.

(Continued on page 20)

## Make Maintenance a Habit to Insure Good Roads Says Haverford Township, Pa., Engineer

**"K**NOW your roads and maintenance is made both easier and cheaper," is a maxim of Alex C. Williams, Township Engineer for Haverford Township, Pa. "Maintenance is more of a habit than a method with me," Mr. Williams says, "and consists in keeping the condition of every road in the district constantly in my mind. Every spring and fall an extra drive is made to put the surfaces in good condition."

Practically all of the 65 miles of paved surfaces in the township are asphaltic, of one type or another. Before starting out to patch, the roads are divided into three groups: 1. Those surfaces which have a few cracks to be poured or small areas to be sealed; 2. Those surfaces which have more or less dried out and badly failed; 3. Those surfaces which have failed completely either from age or poor construction, more particularly those whose failure has been brought about from the sub-base conditions.

Surfaces in the first group can be kept in first class condition at a small cost per yard if properly gone over about twice a year. The large cracks are sealed with hot asphalt and for the fine cracks and spot treating small areas, Headley No. 3 asphalt emulsion has been used for the past few years with satisfactory results. The ease with which

this material is applied makes it a very economical job.

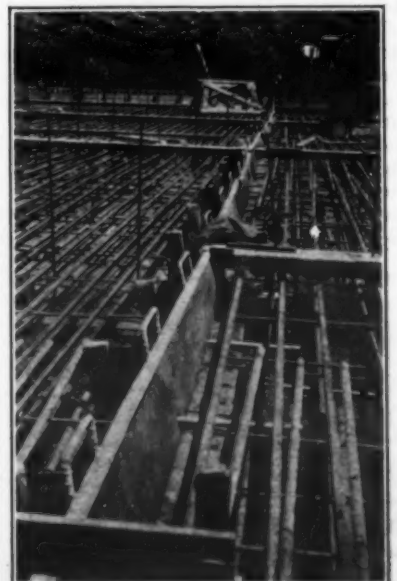
The roads in the second group generally require some pre-mixed patching material in addition to spot-treating the worst places to bring the old surface up to a smooth riding surface, preparatory for the surface treatment which these roads will receive. Mr. Williams reports that 1/4 to 1/3-gallon of cut-back and 20 pounds of chips per square yard takes care of most cases very satisfactorily. In extreme cases, a double treatment is necessary. Under certain conditions, asphalt emulsion is used on this type of work with excellent results. When using the emulsion, however, the chips must be applied immediately for the best results.

Mr. Williams has found that it is not economical to spend large sums of money on the surfaces of the roads in the third group. These should be kept as passable as possible with the minimum expense until such time as they can be rebuilt, either entirely or in sections.

With a few well-instructed men under close supervision, maintenance costs can be kept very low on a yardage basis. In Haverford Township it has been possible to carry on this work and keep within the reduced highway budget without resorting to Government assistance.

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C. & E. M. Photo  
Expansion Joint Header and Reinforcing for the Invert Slab



# Unusual Features in Underpass Construction

By JOSEPH C. COYLE

ONE of the more important construction projects for which PWA money was allotted to Arizona is the recently completed 17th Avenue underpass on U. S. 80 at Phoenix. The job, which involved the excavation of 13,500 cubic yards, was let to Tanner & Hall of Phoenix, for \$89,500. Two busy railroad tracks had to be cut and shoo-fly trackage laid to carry trains around the central portion of the excavation while the contractor's 1 1/4-yard diesel-air Bucyrus-Erie shovel completed the excavation at that point.

Two 5-yard and two 2-yard International trucks were used to haul the material up a ramp excavated between the shoo-fly tracks and dump most of it on a waste pile near the job, from which it was later re-loaded and used to back-fill. Pumps were installed to take care of surface water and an irrigation ditch which crossed the excavation was temporarily by-passed and a siphon constructed.

A 30-inch storm sewer cut the excavation at the east end. Where this touched the main part of the underpass it was above the level of the footings, so these were poured first, at that point. Along the approaches the sewer pipe was laid before the concrete work, using the Bucyrus-Erie shovel equipped with a steel lifting hook for placing the pipe sections.

## Work on Underpass

The underpass is 532 feet long overall with a depth of 18 feet. The portal walls are 4 feet high and 15 inches thick. The sidewalks along the central sector of the underpass are 8 inches thick, increased to 18 inches at the back where they connect with the walls and act as a footing. These were poured before the walls. Exceedingly heavy steel reinforcing was used in the mat of the overhead slab, which was designed for a thickness of only 2 feet in order to reduce the grade of approach cuts and also economize on excavation. An electric vibrator was used to consolidate the concrete in the overhead slab, because of the closeness of the reinforcing bars. The 1 1/8-inch square and 1-inch round steel bars were spaced 4 1/2 inches on centers. W-bars of 1/2-inch steel were also used. The surface of the slab was waterproofed with 1-inch asphalt planking laid over a 3-ply asphalt impregnated fabric. The slab was cured by the Hunt process.

The main section of the underpass was next poured, before the approaches were constructed. There are two 18-foot roadways, the walls and the central pier through the middle being 2 feet thick and 80 feet long, with ornamental openings at regular intervals. Between the end walls and the retaining walls 6-foot pedestrian walls were constructed. A 13-E Koehring mixer was spotted at the



Checking the Steel Reinforcing in the Roadway Slab of the Phoenix Underpass

## Tanner & Hall, of Phoenix, Complete \$89,500 PWA Project on U. S. 80 in Phoenix

end of the excavation and the concrete was carried forward to the forms in Brown-Bevis rubber-tired buggies.

The subgrade was well sprinkled and then rolled with an 8-ton Austin tandem roller before paving. Paving is 6 inches thick, with a doweled expansion joint every 60 feet and two intermediate contraction joints between at 20-foot intervals. The paving and curb were poured together, with one expansion joint at the middle of the roadway and the other just back of the curb, this being an innovation not tried before in this section of the country.

### Paving Included in Contract

Tanner & Hall's contract included the paving of two blocks of the street immediately north of the subway with asphalt. Excavation for this was done



Concreting Layout for the Phoenix, Ariz., Underpass

with the Bucyrus-Erie shovel and the subgrade was broken up with a Killefer scarifier, drawn by a Caterpillar Thirty. It was leveled with a Caterpillar patrol blade and wet down after which it was rolled with an Austin 12-ton roller, which was followed by a 6-inch stabilizer course. Next came the 4-inch base course and a 2-inch top course, made with grade D asphalt, was laid and lightly covered with fine aggregate. The job was completed far in advance of the time limit.

### Personnel

R. C. Tanner, W. E. Hall, H. R. Simons and B. L. Willis comprise the Tanner & Hall organization. On this contract W. L. Johnson was Construction Superintendent, George Lang, Resident Engineer and Eugene Gilpin his assistant.

## N. J. Beam-Type Joint



By H. W. GIFFIN,  
Engineer, Surveys and Plans, N. J. State  
Highway Department

SOME five years ago it became apparent in New Jersey that trouble was developing at transverse joints. Slab ends were becoming displaced and the 3/4-inch dowels were failing to hold the two adjacent slab ends to the same relative elevation. After considerable study of the problem, during which a test road containing several different designs was constructed and tested to destruction the joint structure now in use in New Jersey was designed.

### Pavements Weak at Joints

It is axiomatic that the subgrade bears all the load which comes to the pavement. The chief purpose of the pavement is to distribute the load over sufficient area of subgrade that no portion of it is overloaded to the point that any rearrangement of subgrade particles takes place. As long as the subgrade remains dry, this condition is fully met in the large majority of cases. However, when the subgrade is saturated, much of its stability is lost and, where the intensity of pressure is highest, some rearrangement of subgrade particles takes place.

The area of high intensity is at the slab corners. Since two corners are close together at the transverse joint,

### Rolled Channels Used for Dowels Held Rigid in Assembly that Has Proved Its Worth

the whole area of subgrade at the joint can be said to be weakest in respect to its ability to sustain the loads. Because the transverse joint is open a large part of the year, water collects on the subgrade in the area under the slab ends to a greater extent than at other portions of the slab. The action of traffic sweeps water along the pavement until the groove of the transverse joint interrupts it and allows it to enter the joint space or deposits it on the shoulder adjacent the transverse joint.

The prevalence of water at and near the joint and the inability of the slabs to distribute the loads at the joint over sufficient area of subgrade has led to the effort to prevent the entrance of water and to give additional support to slab ends with the purpose of preserving the stability of the subgrade against softening and overloading. The joint structure then accomplishes two functions, each of which is essential to the other.

### Dowels Reinforce Joint

The distribution of the load over a

greater area of subgrade is accomplished by making two slab ends bear equally the load on one of them. This is done by fastening the two ends together. In this particular device twelve dowels or beams are used in a 10-foot width. They are not evenly spaced, but are concentrated more at the corners because of the distribution of wheel loads and lack of subgrade distribution under the corners. Each dowel or beam is a channel section 2 inches deep with a 1/2-inch web and 7/8-inch flange weighing 42 pounds per foot, or seven pounds each for a length of 20 inches, giving a total of 84 pounds of steel across the joint.

When adjacent slab ends are not maintained at the same relative elevation, it is because the dowels have become bent. The dowels in this joint are channel sections instead of round because of the greater stiffness for the same amount of material. This stiffer beam works over a greater length since what would otherwise be a concentration of pressure at the faces of the joint is distributed over a greater length of dowel or beam. Before the dowels can bend appreciably, they must first destroy the concrete on their upper and lower surfaces at and near the faces of the joint, that is, bellhole. Twelve 3/4-inch round dowels bellholed appreciably under test. In time the channels might also bellhole if this concentration of pressure at the faces of the joint were not distributed laterally along the joint faces. Angles 1 x 1 x 1/8-inch are laid along the joint faces in contact with the upper and lower sides of the dowels. Contact between dowels and angles is maintained by C clamps on the angles placed between alternate dowels.

Outside of the waterproofing features these channel beams and distributing angles comprise the essentials of the joint structure. Other parts are accessories, needed only to make certain the correct installation and maintenance of position of these essential parts during the concreting operations.

### Rigid Dowel Supports

The dowels or beams are positioned and supported by a cross beam of channel.

(Continued on page 10)



C. & E. M. Photo

The Assembled Beam-Type Expansion Joint



# This may be the answer to your highway problem

This Ingham County, Mich., road is the answer to the problem facing many road builders. Where smooth, lasting, but economical surfaces are needed, the type Ingham County has used extensively may well be the answer.

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## Snow Plows Aren't Made in a Minute

If the old saying "In the spring a young man's fancy lightly turns to thoughts of love" has any truth in it, there should be a corollary "During the dog days, a highway engineer's thoughts turn to snow." Unfortunately neither of these sayings is strictly true. We shall make no attempt to prove our sweeping statement regarding young men, but there have been so many evidences of failure on the part of highway engineers to give proper consideration, during August dog days, to preparation for snow removal that it is easy to refute the corollary.

Perhaps the strongest refutation comes from a manufacturer of snow plows, who said to us very emphatically that the importance of placing orders for snow fighting equipment during the late summer and early autumn months can hardly be exaggerated. This is true, from the point of view of both the manufacturer and the user. Of course several highway departments, having had their lessons last winter, have taken steps to organize their forces and increase their snow plowing equipment this summer, in anticipation of the wintry months ahead. One mid-western state highway

department sent frantic telegrams to all the snow-plow manufacturers during one of the worst of last winter's storms, begging for the immediate delivery of any kind of a plow, just so that it would move snow. It is fairly safe to assume that this highway department has already made some preparation for next winter's snow removal problems.

There are unfortunately many more who will wait until the snow is actually on the ground before considering seriously increasing their front-line snow forces. Snow plows are emergency equipment and when they are needed, they are needed badly. It is impossible for a manufacturer to take care of emergency orders when he is pushing production night and day during the winter for those who were merely tardy. The result is frantic, disorganized attempts at snow removal, with miles of highways unplowed because there just isn't the equipment to do it, followed by financial loss, suffering and often death.

This kind of emergency can be avoided by taking stock of your snow fighting equipment and strengthening the weak links NOW.

## From Frost Boils to Summer Eruptions

The epidemic of frost boils on highways last winter was even more destructive than the rash of pavement blow-ups in the July heat wave. Ohio had literally hundreds of miles of the state highway system marked on her detour map as impassable to heavy vehicles because of frost boils, while many other states as late as June and July still displayed, "Caution—Rough Road" signs where frost boil areas had been patched up and the damaging moisture had evaporated in the drought and heat of summer's sun.

Frost boils can be cured. The remedy is, simply and directly, drainage. Ways and means were discussed in a valuable paper presented in the August, 1936, issue of CONTRACTORS & ENGINEERS MONTHLY. Let all highway maintenance engineers look into their back files and study that article carefully. There is also at least one fine piece of frost boil and drainage literature available from an association of manufacturers which should be in the hands of every engineer whose reputation ever suffered from a "frost boil."

The summer affliction of blow-ups in 1936 even exceeded the epidemic of 1931 when we saw a concrete pavement heave and spall not more than 100 feet ahead of us on the state highway leading into Wausau, Wis., from the south. This year there seemed to be minor blow-ups in almost every mile of road in the four Mississippi Valley states we traversed during the first two hot weeks of July. And the major heaves came all too frequently with one slab mounting the other, or merely buckling.

One would say that expansion joints should control the expansion of concrete slabs and prevent buckling. They do on new slabs but the materials used

to fill the joints may well lose their elasticity in a few years and even the open, or air-space, joints may become filled with sand or dust and hence become ineffective in absorbing the great forces created by the sun's rays beating down on the oil-smeared surface of the concrete.

There were some states that gave up expansion joints in concrete roads a few years, saying that the blow-ups would occur anyway and so "why worry." Perhaps they were right for blow-ups still do happen in roads with and without expansion joints. One state, Wisconsin, is now using expansion joints every 30 feet and has eliminated contraction joints entirely. New York is going in the opposite direction and each year or so pushes the expansion joints farther apart.

In Michigan there were around 400 pavement blow-ups in early July, costing about \$11,000 to repair. That is a major maintenance expenditure that would be unnecessary if adequate provision were made for expansion in the design.

This brings up the question of the smoothness of the subgrade as a contributing factor in damage caused by the expansion of the concrete slab. Some states use paving felt or roofing paper on the subgrade to prevent absorption of water from the concrete. How much does this reduce the coefficient of friction between the concrete and the subgrade and permit the slab to slide easily during periods of expansion, thus relieving compression and aiding the movement of the slab? Does the natural subgrade, rolled to relative smoothness, retard the movement of the concrete slab over its surface during these periods of expansion? There are some interesting re-

## Suretyship in Relation To Construction

Corporate suretyship was first attempted a little more than 100 years ago in England for the purpose of indemnifying householders against the speculation of their servants. The undertaking was not successful. The first enabling act permitting the conduct of suretyship in the State of New York was passed in 1853, but not until 1872 were any of the existing operating companies incorporated.

Corporate suretyship as it applies to the performance of construction contracts is a tri-party agreement, an obligation between the party in whose favor the bond is written, the party in whose behalf the bond is written, and the party who acts as guarantor, known as the "surety." The obligations impose certain important reasonable requirements for a sympathetic understanding of the problems of each other, and this promotes cooperation within legitimate limitations.

The obligations further assume that party number one, representing the one in whose favor the bond is written, will furnish the contractor with complete specifications and plans that will enable the prompt and satisfactory performance of the contract. In addition it imposes upon party number one that no changes in specifications and plans be made that would increase the cost of the performance of the contract without the knowledge and consent of both the contractor and his surety. Nor has this first party the right to increase the volume of work on the contract without the consent of the surety, because it frequently results in the extension of the contractor beyond his limitations, thereby resulting in defaults.

The obligation of party number two, the contractor, is to understand definitely the requirements of the contract upon which he is bidding, and to perform it in accordance with the specifications and plans upon which he based his bid. This is not always done, and especially during the past few years when many contractors have left their accustomed field of construction activity to venture into others where more work was being done, there has been a tendency to submit the lowest bid, regardless of specifications.

The obligation of the third party to this agreement, the surety, is first to bond no contractor who is not fully qualified to perform the contract upon which he may be the low bidder. It is also the obligation of the surety to know definitely the basis of the bid for a contract on which they are requested to furnish a performance bond. It is the further duty of the surety to fulfill promptly its obligation of the bond in case of the failure or default upon the part of the contractor, providing the obligations of the owner or his representative have been fulfilled.

In setting forth the above brief statement of the relationship of suretyship to the construction industry in a paper before the last annual convention of the American Road Builders' Association, S. M. Williams, President of the Bureau of Contract Information, went on to

search problems right there which may lead to a cure for our epidemics of eruptions during heat waves.

Speaking of research in the expansion joint field, New Jersey has spent five years in the development of a new type of reinforced joint of unusual strength which is described on page 2 of this issue. While New Jersey pavements are not subjected to long periods of high temperatures which cause so much damage in our central states, still designing engineers may find in this article helpful suggestions and stimulus for further study of joints to prevent blow-ups.



Courtesy, Pioneer Gravel Equipment Mfg. Co.

"It's a Rock Crusher, Warden. We All Chipped In and Bought It."

stress the importance of surety companies writing bonds for reputable and responsible contractors only. Much of the criticism of surety companies has been based on the fact that bonds were written for the irresponsible contractor. And yet there were many contributing factors. One of these was the need for a clearing house for the construction industry wherein the past and present records and financial status of concerns engaged in construction work could be established for the benefit of those legitimately entitled to them. Such a clearing house exists in the Bureau of Contract Information, an independent impartial non-profit making, fact-finding institution. The cooperative support of the Bureau by surety companies has been because of their desire to eliminate the irresponsible contractor, who is also a problem to those who award construction contracts, as well as to responsible contractors.

The value of the surety company to the public is a very real one, and it is the aim of the surety companies working in conjunction with the Bureau of Contract Information to insure the placing of contracts, both public and private, in the hands of responsible, competent contractors who are in a position to fulfill them.

## "Caution Zones" Are New Safety Factors

New distinctive caution markings, consisting of yellow lines parallel to the black center line at points where passing other vehicles is hazardous, are being applied on Indiana state highway surfaces. The "caution zones" are being designated at all curves where there is a change in direction of three degrees or more, and on all grades where the motorist has less than 1,000 feet of sight distance ahead.

Just as the center line on the state highways of Indiana has proved to be an effective aid in reducing accidents, the new caution or no-passing marker at curves and grades will, it is hoped, contribute further to the safety of motorists. Drivers disregarding the caution marking at curves and grades by passing other vehicles moving in the same direction will be guilty of reckless driving and subject to arrest.

Special equipment for the application of the yellow paint is being used, and the work is being done by state highway maintenance forces in each of the six state highway districts. It is estimated that between 30,000 and 50,000 gallons of paint will be required for this new safety program. While the marking will cost several thousand dollars, it is believed that the additional safety resulting from observance of the no-passing zone will more than justify the expenditure.

This designation of no-passing zones at state highway grades and curves is one of the many steps being taken by the Indiana State Highway Commission to increase the safety of motorists by eliminating possible hazards. Other safety factors include the construction of grade separations, installation of flashing signals at highway-railroad intersections, wider traveling surfaces, wider bridges, culverts and shoulders, the use of reflector signs and regular maintenance.



# New Ideas in Concrete Paving Operations

PAVING 3.158 miles of Indiana Route 62 just north of Jeffersonville, across the Ohio River from Louisville, Ky., the Wilmore Paving Co., of Middletown, Ohio, used new equipment, one piece of which was the first commercial unit to make its appearance on any concrete paving contract. This was a new mechanical longitudinal float that does away with that tired feeling and its accompanying poor results after bull-float operators have been hauling the float for half a day. Since this new machine does far more than the old floats it has been christened a "longitudinal finisher." In addition to this a power-operated strike-off to provide a flat bed of concrete on which to place the reinforcing mesh 2 inches below the top of the forms was operated by the paver winch.

## The Longitudinal Finisher

Riding the forms, this new Koehring longitudinal finisher is mounted on single wheels forward on each side and two wheels on each axle in the rear to iron out any irregularities. Further insurance of smooth riding is furnished by the scrapers to clear the forms of concrete ahead of each pair of rear wheels, and by the 14-foot wheel base. The pavement being laid was 20 feet wide but the machine is adjustable to widths from 8 feet to 22 feet 6 inches by screws which slide the wheels in or out on a 2½-inch shaft. This feature was used effectively on the Wilmore job for finishing a widened curve which the regular finisher ahead could not touch. The transverse finisher rode the inside forms and the longitudinal finisher rode the outside forms.

The machine is operated by a Wisconsin motor through two transmissions, one for the forward movement of the machine and the other for the carriage of the longitudinal finisher. Chains give positive movement to the carriage while the screed is oscillated by a single channel bar running the full width of the machine and moved by eccentrics. The channel oscillates the screed by two pins on the screed. There is an automatic shift to reverse the side-to-side movement of the screed by means of a lug on the chain. The machine can be stopped at any moment by the operator, who rides the narrow platform on the screed carriage, by pushing on a continuous bar which runs the full width of the machine and which has lugs so that the operator can reach over with any tool and push the nearest lug.

The 12-foot screed is 10 inches wide and is made of steel and loaded with concrete to weigh 710 pounds. It is slightly rounded at the ends to enable it to ride the concrete smoothly and not dig in. It does not rest on the concrete as its plane of operation across the road is controlled accurately by a pair of tracks or templates which are adjustable to the crown of the road. The plane of its longitudinal motion is controlled by rollers. The screed may be lifted from the concrete by toggles actuated by a long lever on the screed carriage, and when it is let down its position is limited by an adjustable pin. The screed carries a considerable amount of material from side to side, and is thus able to deposit concrete in low spots. It cannot dig in as its elevation is controlled by the templates. The weight of the screed is sufficient to enable it to cut off high spots in the surface. Instead of pushing the concrete over the forms at each pass and wasting it, the screed is lifted and carries the material back again. The entire machine advances 4½ feet while the screed is making one trip across the slab.

## Wilmore Paving Co. Used Power Strike-Off and New Longitudinal Screed on Concrete Road

One man operated the longitudinal finisher on this contract. The man who inserted the center strip rode a plank cantilevered behind the machine and dropped the premoulded material into the slot formed by a plow attached to the back of the frame.

### The Concrete Strike-Off

Indiana specifications require the placing of the reinforcing mesh 2 inches below the top of the forms. In the old

days this was done by a rather hit-or-miss smoothing off of the concrete by the puddlers, then came the strike-offs pulled by the pavers at a set distance behind, making it necessary to have extra long booms on the pavers. The Wilmore Paving Co. has devised a new method which has many things to recommend it.

A heavy structural steel strike-off runs on the forms on wheels and is heavy enough to pull quite a load of concrete ahead of it without riding over it. The strike-off is attached to the paver by a ½-inch cable at either end and run through sheaves at the ends of the Baker subgrade finisher immediately behind the paver. The cables are then run under the paver to the winch used for running the derrick when industrial railway hauling of batch boxes is used. When the paver is moved ahead the operator pays out the cable until it is time to strike off a new section for the placing of the reinforcing fabric. Then the strike-off is pulled in by the winch and a smooth bed left for the mat.



C. & E. M. Photo  
Expansion Joints As Assembled and Wired in the Contractor's Yard

### Preparing the Grade

Prior to the letting of this contract the state highway department had a crew core bore this entire stretch of highway, particularly where frost boils showed at the surface, to locate free water beneath the roadway. At all points where free water was encountered the design called for the placing of

(Continued on page 18)

# for A. J. FORSCHNER Const. Co.

One Northwest in 1924  
One Northwest in 1925  
Two Northwests in 1927  
Two Northwests in 1936

WHEN the A. J. Forschner Construction Company, long prominent in the construction field in Chicago again found themselves in need of a Shovel and Pullshovel, the high quality of past service from their Northwest Machines dictated their selection.

Repeat orders from dependable contractors are the best testimonials to service that any manufacturer can offer.

**THE NORTHWEST ENGINEERING CO.**  
The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers.  
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SKIMMERS

# NORTHWEST

GASOLINE, OIL  
DIESEL OR  
ELECTRIC  
POWERED

BUILT IN A RANGE OF 15 SIZES — 3/8 YD. CAPACITY AND LARGER





Johnson Road Builders' Batcher

## Single and Multiple Material Batcher

The overhead unit frame for Johnson single and multiple material batchers for road builders, which are made by the C. S. Johnson Co., Champaign, Ill., supports the fill valves, hand levers, aggregate hopper and the beam box. This frame is bolted directly to the bin bottoms and no exterior connections or supports are required.

The jam-proof radial fill valves with bronze bushed pivots and Alemite lubrication are of all-steel construction. The weighing beam box is a separate unit, containing a tare beam, a weigh beam for each aggregate in the multiple material batchers, a beam lifter for each beam, and the dampened type balance indicator. The balance indicator is of the pendulum type and has the Johnson dampened pendulum operation which eliminates pointer vibration and is designed for accuracy. The case is all brass, painted black, with white pointer background and graduation. The pendulum is safety locked against falling out of place while handling.

The aggregate hopper is of sturdy all-steel construction, electric welded throughout. The steep discharge angle enables the hopper to drain quickly and completely. The overload removal ports, one for each material, are spaced for convenience, of ample size, and are covered to prevent spillage. The discharge door is a self-closing radial type valve. The opening is long and narrow to facilitate charging narrow truck compartments. The pivot pins are bronze bushed and Alemite lubricated. The operating lever is placed conveniently by the side of the weigh beam box and filling levers.

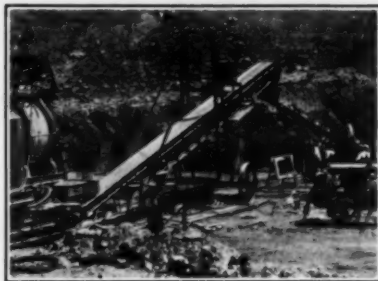
The multiple aggregate batcher fits the bin openings of Johnson demountable bins and portable section bins. It is also readily attached to any bin with a minimum of special provisions. This batcher is provided as a two or a three-material unit and is available in two sizes, Model 14 for half-yard pavers and Model 28 for 1-yard pavers.

The Johnson single-material batcher is also made in two sizes, for 1/2-yard and 1-yard pavers, and fits any bin. If desired, this batcher may be furnished

## Handling Wet Concrete from Mixer to Forms

The use of 24-inch x 60-foot Porta belt conveyors for handling wet concrete from the mixer to the forms has proved successful on a number of construction jobs, including the new enclosed reservoir at Reading, Pa., built by C. W. Good, of Lancaster, Pa. The James Stewart Co. of New York is using similar equipment for handling the concrete for the Express Highway in New York City and the Tennessee Valley Authority has just ordered nine of these conveyors for the handling of aggregates at Wilson Dam, one of its

with gang operation parts, making it possible to operate two batchers from one position. The fill and discharge valves are arranged for selective operation from this one position. Toggle-locked drop door discharge valves are standard for gang operation but the counterweight type discharge gate, which is standard for single-material hoppers, can be furnished if desired.



Placing Concrete in Forms With a Porta Conveyor on the G. W. Good Contract for a Reservoir at Reading, Pa.

chain of construction projects.

These conveyors, known as Model 347 and made by the Portable Machinery Co., Division of A. F. Farquhar Co., Box C-1, York, Pa., are made up of standard sections, permitting the contractor to shorten or lengthen the conveyors to suit the conditions of the job. Generally the conveyor is mounted on an elevating wheel truck but the conveyor boom can be quickly detached from the wheel truck, permitting its use as a horizontal unit.

## How To Choose Correct Pump

An interesting and informative booklet, describing the type of service rendered by diaphragm and centrifugal pumps and the kind of jobs for which each is best suited, has been prepared by Marlow Pumps, Ridgewood, N.J.

The effect of pumping large quantities of sand, the comparative weights, the air-handling capacities, ability to keep excavations dry are all discussed in this folder from the point of view of both types of pumps.

Copies of this Bulletin 34 may be secured by those interested direct from Marlow Pumps by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Allocation of £282,800 has just been made for the elimination of grade crossings in the Johannesburg area of South Africa, to be done by the South African Railway authorities in conjunction with the Municipal Council. The funds are a part of the sum of £550,000 set apart out of Railway surplus for this purpose during the current year.

# KOEHRING

Instantaneous dumping and fast door-closing are important factors for high speed dirt-moving with the Koehring Trail-Dump. The Automatic-Hand controls these operations with maximum speed and minimum mechanical complication.

**KOEHRING  
HEAVY DUTY**

Many years of experience, building pneumatic tire hauling equipment, established the Koehring Dumptor as an exceptionally speedy dirt-moving unit. Low maintenance, extra yardage moved, a minimum of delays, are assured in "tough-going."

## KOEHRING COMPANY

Pavers - Mixers - Shovels - Cranes - Draglines - Dumptors - Mud-Jacks  
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## USE RIGHT BUCKET FOR THE JOB



Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.



THE HAYWARD CO., 32-36 Day St., New York  
**HAYWARD BUCKETS**



# Transcontinental Trail Paved with Plant-Mix

By ROBERT A. ALLEN,  
State Highway Engineer,  
Nevada Department of Highways

To complete a vital link in the Transcontinental Arrowhead Trail across Nevada, contracts were awarded by the Nevada State Highway Board of Directors to the Frederickson & Watson Construction Co., Frederickson Bros. and Jones and King, of Reno, on November 15, 1935. This contract called for the construction of 15.13 miles of asphaltic surfaced highway between Jean and Bard in Clark County, near the California state line. Work on the project, which is one of outstanding importance to the state, was started soon afterward and was finished in May of this year.

Its importance lies in the fact that upon its completion it gives to Nevada a continuous stretch of 150 miles of primary road on the Arrowhead Trail cross country route, which also forms the main artery for motor traffic between Salt Lake City, Utah, and Los Angeles, and southern California, as well as to provide better travel facilities for citizens of Reno and western Nevada, and those living in the great copper districts around Ely and the northeastern part of the state, making connection with the Arrowhead Trail. The cost of the project is approximately \$220,000.

Arrowhead Trail serves Bryce Canyon National Park, Zion National Park, and Cedar Breaks National Monument, in Utah, as well as the Kaibab National Forest in northern Arizona before striking across the northwest corner of Arizona to enter Nevada at Mesquite. This same Arrowhead Trail, in Nevada, serves the Boulder Dam area and the Colorado River country. From Las Vegas, through Boulder City, since the completion of the dam and a roadway across its top, a high gear road connects with Kingman, Arizona, affording a direct approach to the south rim of the Grand Canyon of the Colorado River.

In addition the Jean-Bard unit of improvement will bring the entire highway from California to Las Vegas into excellent condition for the greatly increased winter travel from Los Angeles and the southern California sections to and from Death Valley.

## Scope of Contract

The Nevada State Highway Department, Robert A. Allen, State Highway Engineer, was eager to put this stretch of the transcontinental route between Jean and Bard into prime condition. The contract provided for the reconstruction of the present state highway, including widening the road bed and culverts; placing a sub-base and base courses; constructing a Class B plant-

## Jean-Bard, Nev. Unit of Arrowhead Trail, 15 Miles in Length, Completed by Contractors in May

mix asphaltic surface with Type SC-4 asphaltic material; construction of shoulders; salvaging and relaying the present surface and finishing the roadway for the entire distance a width of 20 feet.

Intersection of roadway cut slopes with the ground line were rounded beginning 5 feet back of and extending 5 feet out from the slope stake. This procedure was followed at all places except where the material encountered was solid rock. Where the solid rocks, granite and sandstone, had disintegrat-

ed so that they could be handled as earth, this soil was scuffed off and the slopes rounded.

In places where a layer of earth covered a rock cut such layers were similarly rounded. Allowance was made for insufficient depth to utilize the full 5 feet of rounding. However, these earth-covered rock cuts were proportionately rounded to meet requirements.

## Water Supply Important

Water for this job proved to be an important problem. Because this Jean-Bard section of Nevada affords very little water near the right-of-way it was necessary to haul water for considerable distances to the construction site.

A well producing approximately 10,000 gallons per day was developed near Jean. This supply was inadequate, however, and to supplement the supply three railroad tank cars, of 12,000 gallons capacity each, were shunted each day the 30 miles from Las Vegas to the job. In addition a 4,600-gallon motor truck was used when excessive demands developed.

## Culverts and Embankments

No bridges of any size were required on this stretch of southern Nevada highway. Rivers are non-existent but numerous dry washes, typical of the desert country, require culverts. Dry and harmless during ordinary weather conditions, these washes, sometimes with high gradients, after heavy and sudden rains in the spring and autumn become raging torrents with potential force great enough to wash away large sections of roadway. Against such emergencies corrugated metal pipe culverts, with concrete headwalls, of adequate size were installed. These culverts give excellent service and long wear for the peculiar run-off conditions experienced.

All rocks and boulders uncovered in excavation or found within the limits of the right-of-way were placed in embankments, reposing at least 6 inches below the subgrade elevation. Where the depth of embankment did not meet the requirements the rocks and boulders were uniformly distributed along the

(Continued on page 21)



● Once you see an Austin-Western Motor Grader in action the things we've been telling you are no longer talking points—they become real factors in performance—and they represent money in the bank to the man who owns a "77."

Try one out on any tough piece of road—you won't need any one to tell you that power steering lets you give your whole attention to the work at the blade, whether you're in the ditch or on the crown, and the fast accurate action of hydraulic controls for every blade adjustment lets you hold the blade where you want it without lost motion.

Take a full load against the blade and see how she'll hold straight down the road—no side slip, no wheel skidding, because you're getting all the power your engine develops, at the blade—and the wide front axle with leaning wheels is keeping the front end right where it belongs.

You'll find these are only a few of the reasons for customer preference—based on superior performance at the lowest cost per mile.

Read over the list of major "77" features, get in touch with the Austin-Western salesman nearest you, or write for the new Motor Grader Bulletin just off the press.

## The Austin-Western Road Machinery Co.

Home Office: Aurora, Ill. Cable Address: AWCO, Aurora, Ill.  
Branches and Warehouses in Principal Cities

# Austin-Western

## THESE 8 FEATURES

Powered by Austin-Western were developed to give you the all round all year machine the "77" is today

- 1 Powerful Diesel or gasoline motor.
- 2 6 forward and 2 reverse speeds.
- 3 Floating drive—solid steel housing relieves the drive shaft of all weight and operating stresses.
- 4 Dual (8 tire) drive—power on all drive wheels provides real traction.
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- 8 Arc welded steel frame—large diameter circle—weight is concentrated over the blade for maximum effectiveness.

## THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs.  
Spreads a full, even beam of 8000 candlepower right where you need it.



Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. It is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 96 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lantern

NATIONAL CARBIDE SALES CORP.  
LINCOLN BLDG. NEW YORK  
(Opp. Grand Central)

The Austin-Western Road Machinery Co.  
Y, Aurora, Illinois  
Please send me my free copy of "Judge Motor Graders at the Blade."

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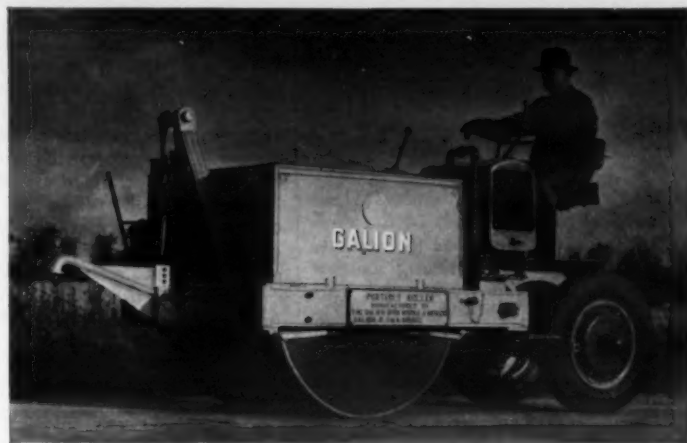




# Galion



Galion Chief Road Roller with "Roll-A-Plane" Attachment. Thus three rolling units are provided, each of a different diameter and so constructed that the three rolls may be placed upon the same exact plane, producing a surface not only free from waves, vibration and impact, but also simplifies the method and reduces the cost of rolling.



Galion Portable Roller—an economical, versatile unit for rolling all kinds of patch material . . . for compacting loose material, rolling drives, lawns, etc.

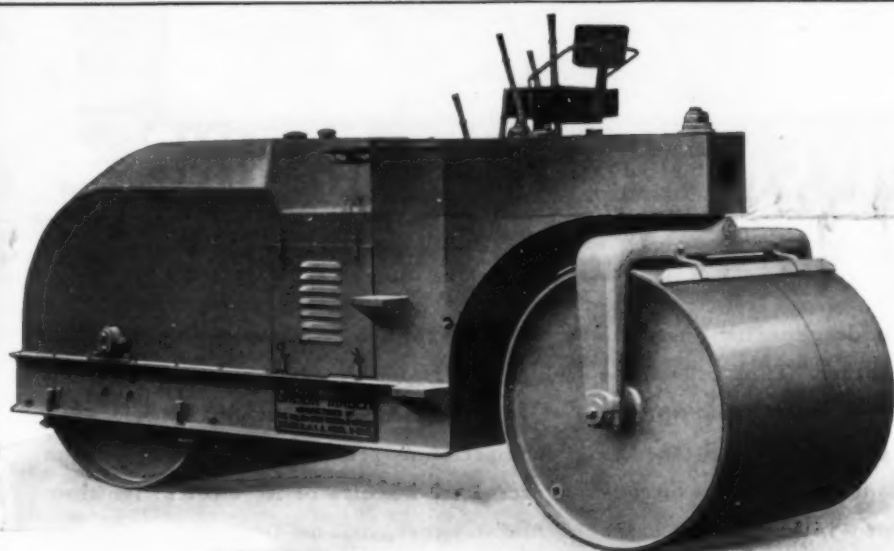
## Rollers

There is more than "Just Rollin' along" with Galion Rollers. It's true they roll along in grand shape but a good roller must do more than that. It must have a dependable motor; flexibility and smoothness of operation; be able to cover ground in a day's time; be sturdy in construction and economical in operation.

Galion Rollers have all of these requisites. From every angle . . . appearance, workmanship, power, control and performance . . . Galion Rollers are leading the field. And there is a roller in the broad Galion line of a type and size to meet any rolling requirement you may have.

Galion Engineers know Road Rollers . . . they have been building them for a good many years now. They are constantly studying and improving the line to give you the best there is to be had. We pass this experience on to you. Call on Galion.

**The Galion Iron Works & Mfg. Co.**  
Galion Ohio



Galion "Variable Weight" Tandem Roller. Weight is variable between 7 and 10 tons, making this roller the most economical and practical ever offered to road builders and pavers.

Shown below are the Galion "Warrior" in 5, 6, 7 and 8 tons, and the Galion "Chief" Road Roller in 10 and 12 tons.



**MOTOR GRADERS — PULL TYPE GRADERS — PLANERS — DRAGS**

## N. J. Designs New Expansion Joint

(Continued from page 2)

nel section across their ends. These are notched to fit the ends of the dowels, with a slight clearance to facilitate assembly. Assurance is thus given that all dowels are practically parallel. This is necessary to enable the dowels to slide in the concrete and to prevent the structure from binding the slab ends rigidly together. The more rigid the dowels the more nearly parallel they should be. Otherwise, there will be cracked slabs, the cause of which might not be apparent.

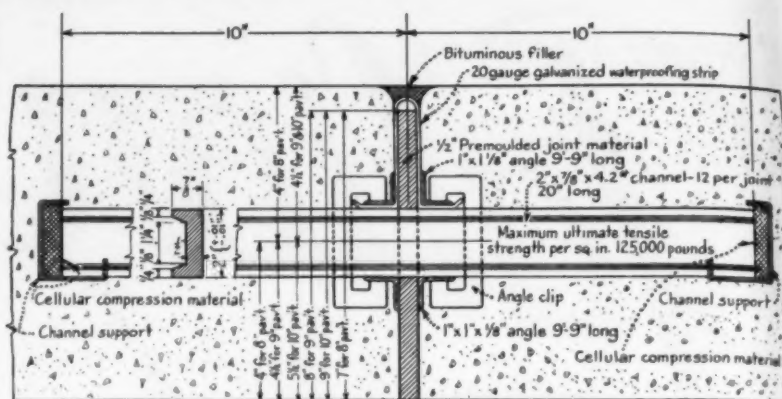
These cross channels supporting the dowel ends have sufficient rigidity to sustain the weight of a heavy man without permanent bending, and the whole structure is rugged enough to withstand any reasonable accidental force, an essential characteristic of this joint structure. Laborers are very careless about stepping on and disturbing joint structures, especially when covered with a little concrete. Unless the structure is sufficiently rugged to withstand these forces, finishing machines and vibrating equipment often disturb parts of structures and displace them from their true position. Many joint structures, good in other respects, are ruined in this way without its becoming known. A crack appears in the slab but its cause is not attributed to a weak joint structure which has allowed the dowels to become displaced from their true position.

### End Supports

The two cross or supporting channels are supported at the ends and bolted to angle brackets, which are screwed to bracket holders made of cast iron. These holders are removed after the forms are removed and used over again. The bracket holders are supported in a beveled depression in an angle support which lies along the bottom and inside of the road form. The bracket holders are beveled on the bottom to fit the beveled depression in the supporting angle. The reason for this is that forms are not removed until the concrete has set and contraction or expansion of the slab has taken place. Sometimes forms are not removed for a week or more and sufficient contraction of the slab may have taken place so that a rigid

connection between the two slabs would cause a crack. When there is movement, the bracket holder slides on the beveled surface, the supporting angle having sufficient flexibility to bend down to accommodate the sliding bracket holder. The supporting angle is fastened by a specially designed clamp to the bottom of the road form. Only one clamp is used so that one or both ends of the supporting angle can be flexible enough to bend sufficiently to allow for early horizontal movement of slab ends. All dowels are thus supported on and held parallel to the bottom surface of the road forms through the supporting cross channel, bracket, bracket holder, supporting angle and clamp.

This may seem to be somewhat elaborate and possibly to many, unnecessary. The old way was to support the dowels by some device resting on the subgrade. Even with the best workmanship and materials the subgrade is rarely a satisfactory support. It can hardly be precise and remain so during all of the operations of concreting. When a la-

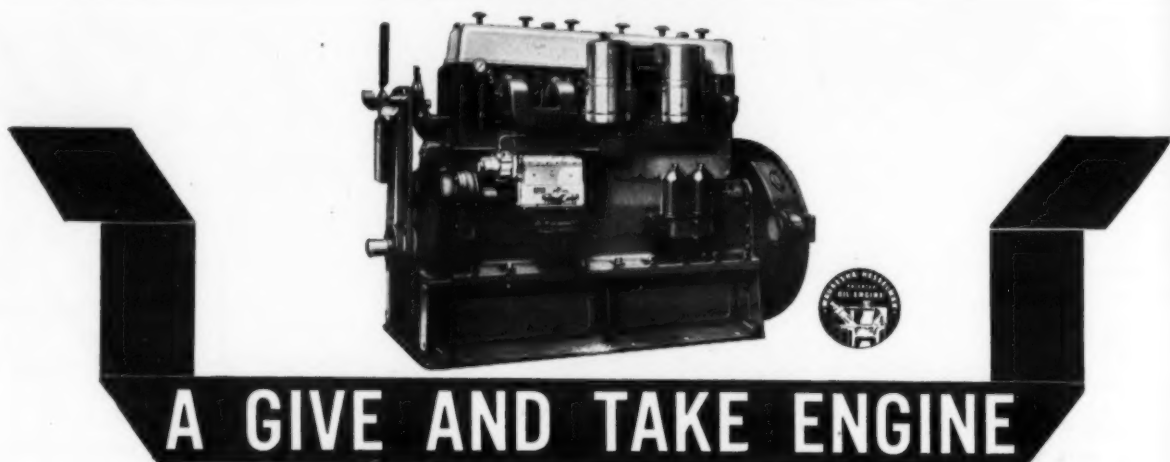


Cross Section of the Beam-Type Joint

borer accidentally steps on a dowel which is supported on the subgrade, the dowel is tilted and remains tilted unless the support is an exceptionally large one. Any irregularity of subgrade, any lack of firmness and any accidental disturbance of the dowel position will result in tilted dowels. The tilting of

some dowels out of their plane means that during a horizontal movement of the pavement the dowel must bend, the concrete must be crushed around the dowel or the joint is bound and a crack forms some distance away. Any effort to use the subgrade for support and make

(Continued on page 32)



## A GIVE AND TAKE ENGINE for Heavy Duty Service

● In the life of a dragline it's just one heavy job after another. That calls for a *give and take engine*—an engine that can give all the power the job calls for and take the punishment of thousands of hours of continuous performance without calling for time out.

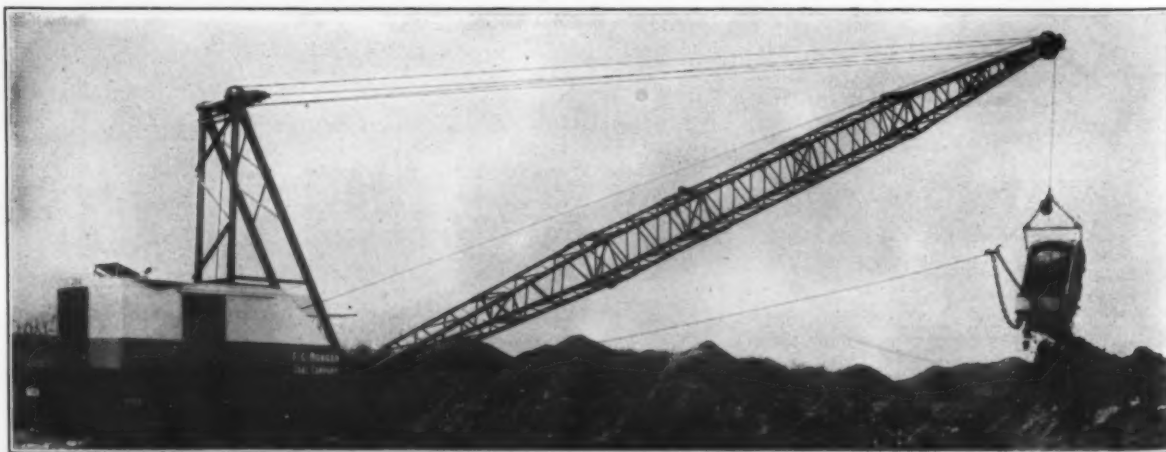
This Marion dragline has that kind of an engine—a 150-160 hp., 6-cylinder Hesselman Oil Engine—one of the Waukesha ELH series, designed for heavy-duty service in shovels, cranes, hoists, draglines, portable and semi-portable construction machinery

as well as for heavy stationary power service.

It burns modern high-speed diesel fuels . . . economically . . . without either high compression pressures or high explosion pressures, because of its electric ignition. Maintenance costs are low, while reliability is improved. Low pressures are easier to maintain and the Hesselman therefore does not lose so much in power or efficiency as wear takes place.

For complete details and specifications—write for Bulletin 918. Waukesha Motor Company, Waukesha, Wisconsin.

Hesselman-powered Marion 39A Dragline stripping coal for F. C. Morgan Coal Co., Millstadt, Illinois



# WAUKESHA ENGINES

### BUYING A PUMP?



### INSIST ON:

- Faster, 100% Automatic Priming,
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THE JAEGER MACHINE CO.  
701 Dublin Ave., Columbus, Ohio

## JAEGER



## Wharf on Dry Land at The Dalles, Ore.

Unusual Construction Job on the Columbia River Prepares for Boom as Inland Seaport

By HENRY W. YOUNG

WITH the completion of Bonneville Project on the Columbia River sometime in 1937, the navigation locks will provide access to the 47-mile pool above for ocean carriers up to 26-foot draft, under lowest water conditions. The head of ocean navigation will then be The Dalles, Ore., a city of 7,000 population located 200 miles from the Pacific Ocean. This city is already making preparations for its debut as a seaport by building a wharf on what is now dry land.

To provide this wharf and other necessary improvements, the Port of The Dalles was formed, a taxing district comprising about one third of Wasco County, and having a population of about 10,000. A \$200,000 bond issue was floated to finance part of the project and the PWA made a direct grant of \$120,000. Of the \$320,000 thus secured, the largest portion, \$230,000, is going into the construction of the wharf and approach, the contract for which was awarded to Parker-Schram Co., of Portland, Ore. Work began in January and finished in July.

### Wharf Built on Dry Land

All the work was done on dry land, except for a short period of high water in May. A Vulcan Super 5000 single-action pile driver handled most of the vertical driving and a Bucyrus-Erie dragline, powered by a 1030 Caterpillar engine, drove the bracing piles, which had a batter of 5 to 12, in an unusual manner. Ordinarily they would be driven by a pile driver floating alongside. With no water available, the crane rig was used to drive them from the deck of the wharf above. The boom carrying the leads and pile was swung out over the edge of the wharf. The dragline cable was then passed around the leads and the pile and brought back to the drum. By winding in on the line, the leads were swung in from the vertical to the proper angle for the bracing pile. The load line then handled the 4,200-pound hammer and the driving progressed at an angle inward toward the rig itself. The bracing piles averaged 74 feet in length with a penetration of 20 to 26 feet and were driven at the rate of four an hour.

### Pile Bents and Deck

The 3,000 fir piles have an average

length of 70 feet and were driven an average of 25 feet to rock. Because of the fresh water and dry climate, the piles were not treated. The pile bents were spaced on 12-foot centers and carried the deck designed for a live load of 500 pounds per square foot.

The deck construction consisted of caps 12 x 14 inches, stringers 4 x 14 inches and deck plank 4 x 4 inches laid vertical with the grain up and blind nailed with 7-inch wire spikes. The contract also included the construction of two trussed sheds, each 460 feet long and 93 feet wide, of girder and joist construction, with three bays, and a 300-foot approach to the wharf which is of similar construction to the wharf itself.

At each end of the wharf, cluster piling was driven in the usual manner to provide facilities for warping in the boats. At the east end, however, there was not enough penetration to give sufficient stability to the cluster. Therefore the cluster was reinforced by a pyramidal bracing system, consisting of two rows of four bracing piles driven on

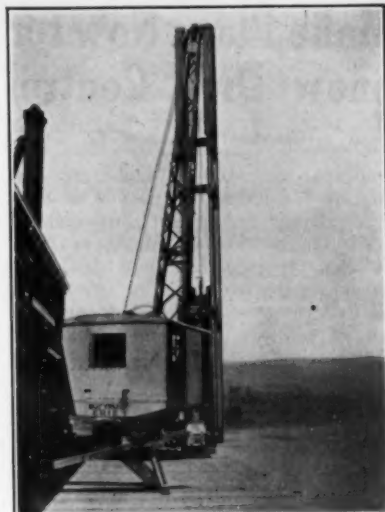
each leg of the triangle, with heavy timber caps set against the cluster at the apex of the triangle.

The Bucyrus-Erie moved about on the deck, doing all kinds of lifting work, including the erection of the heavier shed timbers.

The sheds have walls of galvanized corrugated sheet iron and a composition roof. A Viking automatic sprinkler system is provided in the warehouse sheds and below the deck of the wharf and approach, supplied by an 8-inch Universal pipe connected with city services at both ends of the wharf.

### Personnel

This work is under the jurisdiction of the Port of The Dalles Commission of which W. R. Bailey is President. Charles L. Neller is Port Manager and Col. B. C. Allen and Colby Steel & Engineering Co., were Consulting Engineers. Charles Hageman was Resident Engineer for the Commission, and John J. O'Farrell was Resident Engineer-Inspector for the PWA. For the contractor,



The Dragline Used As a Crane, Driving Fender Piling

Frank Witt was Superintendent and E. Yager, Assistant Superintendent.

## When Final Savings are Greater than the First



## It Proves How It Pays to Forget the Old Stuff

This housing project is now nearing completion. It was originally laid out for standard methods of mixing and placing concrete. Then investigation proved substantial savings could be made by using Rex Moto-Mixers. These estimates showed that Rex Moto-Mixers and a central batching plant made up the lowest cost way of handling the job.



## SAVINGS HAVE EXCEEDED THE ESTIMATE

Direct cost of concrete in place is lower than the estimate. Maintenance cost of equipment has been less per yard of concrete. Two important items of expense, moving of equipment and loss of aggregates in ground storage, have been eliminated. On this job involving 17,000 yards of concrete, placed in all the spots called for in building a complete village of 250 small homes, scattered over 42 acres, it has more than paid to completely forget the old stuff.

How well it paid is evidenced by the fact that the contracting company (nationally and internationally known) is now setting up for another housing project — and the concrete will be handled by Rex Moto-Mixers.

Before you buy, before you bid, investigate the Up-to-Date Methods of Handling Concrete

CHAIN BELT COMPANY  
1666 West Bruce Street, Milwaukee, Wisconsin

## Dirt-Moving Costs Cut To the Bone—

WITH a Sauerman Slackline or Drag Scraper you can dig to a depth of several hundred feet, whether in dry ground or under water, and haul the excavated material any distance up to 1500 ft. at a cost of a few cents per cubic yard. Sixteen different sizes with handling capacities from 10 to 600 cu. yds. per hour.



Write for catalog telling all about these money-saving machines.

SAUERMAN BROS.  
464 S. Clinton St., CHICAGO



## Make Plans Now for Snow Drift Control

(Continued from page 1)

sented at the Annual Conference on Highway Engineering last February, E. A. Finney, Assistant Professor of Civil Engineering at Michigan State College, reported that snow drifts are caused on the highways by any one of the following conditions, or a combination of two or more: cut-sections and embankments; trees and shrubs too close to the traveled way; grass, weeds and vines; farm fences; rubbish, piles of earth, broken down fences, clogged fences; farm and out-buildings; ridges paralleling the highway; low grade lines; snow plow deposits; highway appurtenances.

The present methods of combating the snow drift problems may be classified under: highway design, artificial snow fences, and natural snow fences.

### Highway Design

Our yearly increase of improved mileage with its corresponding increase of snow-removal costs has led to some serious thinking about snow control by proper highway design. Our older highways will be a constant source of trouble until corrected by relocation, or right-of-way treatment. To make a necessary change in location requires considerable litigation and expense. Therefore, when a highway alignment is changed for various reasons a thought to snow control should be included.

The ideal position of the grade line should be equal to, or a little above, the average snow level elevation so that the highway would receive the full benefit derived from the sweeping action of the wind. This method is best adapted to low flat country, and is used quite effectively by our Western states where they try to keep their grade lines at least 18 inches above the adjacent ground level.

The shoulders, ditches, and back-slopes should be designed to provide ample storage space for the accumulation of snow, either from a source of drifting or the snow plow, or both.

The cut-sections should be widened to provide storage space for snow deposits. As cut-sections from 6 inches to 6 feet seem to give the most trouble, shallow cuts should be avoided. Experiments show that from 6 to 10 feet in width should be allowed for each foot of depth of cut.

All rubbish, excess materials left from construction, ridges and brush should be removed at the time of construction. Existing trees should be trimmed to the proper height so as not

to retard the motion of the wind near the surface. Regular maintenance should be provided for the periodical cutting of weeds, grass and brush growing on the right-of-way, and the cleaning of existing fences from the ever increasing growth of vines, grass and tall weeds that are inaccessible to the power mowers.

When possible, right-of-way widths should be increased to provide for the widening of cuts, erection of snow fences, the planting of trees for snow control and to take care of future expansion.

### Artificial Snow Fence

Artificial snow fences may be classified into four groups: the horizontal slat type, the vertical slat type, the solid type and the emergency snow fence.

The horizontal slat snow fence usually consists of 6-inch boards spaced 3 to 6 inches apart, on a vertical support. The supports may be permanent posts set into the ground or they may be made in such a way as to facilitate erection and removal where a permanent fence



Bureau of Public Roads Photo

A Snow Fence Made of Discarded Bags and Framed Guard-Rail Timber

is not desired. An all-metal, horizontal slat snow fence is now on the market, the slats of which are made of galvanized sheet metal 6 inches wide, and spaced about 6 inches apart. A special V-shaped groove is pressed in the top and bottom of each slat to increase further its efficiency and strength. A fea-

ture of this fence is that it is inclined against the wind at an angle of between 23 to 30 degrees, which deflects the air downward, and it is claimed to keep the fence clear of snow as well as pile it twice as high as the fence.

The woven-picket, or vertical slat, (Continued on next page)

**DODGE TRUCKS NOW PRICED WITH LOWEST... 1½-TON ONLY \$505\***

# DODGE TRUCKS SAVE GAS!



1½-Ton Stake—136" W. B., 6-Cyl., \$690\*

As truck buyers everywhere know, Dodge trucks, now priced with the lowest, introduced many extra-quality features into the lowest-priced field. The result has been an economy and dependability unheard of before in lowest-priced trucks! For example, Dodge gas savings are amazing truck owners. Many report "saving up to \$95 a year on gas alone." Other savings reported on oil, tires and upkeep are equally sensational. It pays to get all the facts about Dodge economy before you buy any truck...see your Dodge dealer.

**DODGE**

Division of Chrysler Corporation

## FREE!

**MAKE THE GASOMETER TEST... CHECK MILEAGE FOR YOURSELF**

Dodge gas saving is not a mere claim. It is a proved fact that you can verify for yourself quickly and easily. It is due to the Dodge 6-cylinder "L"-head

engine, with a combination of six special gas and oil-saving features, not found anywhere else in the low-priced field. Your Dodge dealer wants to lend you a little machine called a gasometer that shows you exactly how far any truck, new or old, goes on a gallon. Make your own comparison. See how much a new Dodge truck will save you in gas alone.



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**SAFETY-STEEL CAB**—Another quality feature pioneered by Dodge—steel welded into one solid piece, cab lasts longer, safer for drivers.



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\*List prices at factory, Detroit, subject to change without notice. Special equipment, including dual wheels on 1½-ton models extra.

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1½-TON CHASSIS 116 W.B.

**\$505\***  
1½-TON CHASSIS 136 W.B.

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Williams digging demons also include Power-Wheel, Multiple-Rope and Drag-line Buckets. Write for bulletins.

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**WILLIAMS BUCKETS**



## Snow Drift Control By Fence and Trees

(Continued from preceding page)

snow fence is more widely used than any other. Its ease of handling and storage has made it very popular. The pickets vary in width from 1 to 1½ inches, and are spaced about the same distance apart. The height is usually 4 to 6 feet, but may be erected to any height, depending on local conditions. The fence is supported in a vertical position by posts or angle iron bars driven firmly into the ground. The woven-picket fence is very inexpensive and when not in use it can be rolled up and stored very conveniently. An all-metal, vertical slat snow fence is now being used by some highway departments. The slats are 3 inches wide with a special V-shaped groove in the center, and are spaced about 3 inches apart on angle iron cross members. The function of the V-groove is to give strength to the member and to produce certain effects on the air stream that aids in the effectiveness of this type of fence. This fence is erected at an angle between 20 and 30 degrees with the wind.

The solid snow fence is merely a solid board fence and is too costly and impractical to be used only in special cases. The solid snow fence is used effectively in making snow screens to deflect the snow-laden wind away from the traveled way. For the use of snow screens the direction of the prevailing winds must be constant. The solid snow fence may be used on very narrow right-of-ways since most of the snow will be deposited on the windward side of the fence.

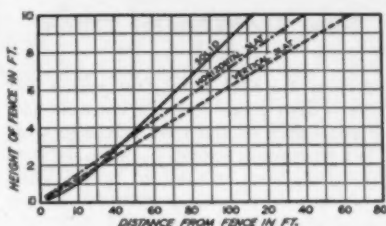
Emergency snow fences have been made by tying old grain sacks, or calcium chloride sacks, several inches apart, to woven wire or chicken fencing stretched in place. In localities where low temperatures are constant throughout the winter season, effective snow barriers have been made by piling up blocks of hard snow, which is inexpensive, and can be easily built up as the depth of the snow increases.

Snow traps are made by snow plowing a ridge in the fields adjacent to the highway. This acts as a snow fence, causing the moving snow to be deposited in the trench left by the snow plow.

### Location of Snow Fence

The proper location for a snow fence is best determined by observation of previous drifting and a study of the general topography along the roadway.

Sufficient snow fence should be provided at each drift spot fully to pro-



Relation Between Height of Snow Fence and Effective Distance

tect the road. With short stretches of snow fence the snow may drift around the ends and cause serious trouble. In localities of heavy snow fall, two or more parallel rows of snow fences have been used. The rows are far enough apart, from 75 to 100 feet or more, so that the drifts will not overlap.

The distance that the snow fence should be placed from the roadway varies with the height and type of snow fence. Fifteen feet for each foot of height of fence is the recommended distance. A fence 4 feet high should be placed from 60 to 75 feet from the road.

In some localities it is necessary to place a snow fence on both sides of the road to obtain full protection. Sudden storms from directions opposite to the prevailing winds will block a road, unless ample protection has been provided to take care of the worse spots.

A good snow fence should be durable, light and compact to facilitate handling, transportation and storage. It should be easily and quickly erected and taken down, or raised to give more service when drifted over with snow. The ease with which it may be erected on any type of ground is an important feature.

The results from some wind tunnel tests on the various types of artificial snow fences may be summarized as follows:

1. Each type of snow fence produces a characteristic eddy which remains constant for any wind velocity and height and type of barrier. The distance from the fence to the end of the eddy varies with the height of horizontal and vertical slat fence by the ratio of 15 to 1 respectively. The solid type fence va-

ries by the ratio of 10 to 1. In other words, a horizontal slat snow fence 4 feet high should be placed at least 60

(Continued on page 30)

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Chicago New York Philadelphia Kansas City  
San Francisco Boston Minneapolis

## Water, Earth and Rock Used for Slurry Base

To provide a satisfactory material as a sub-base for its plant-mix asphaltic oil roads, California has developed what is called the "slurry base." This consists of a mixture of crushed rock and earth binder, weighed from bunkers into the batching box of a hot-mix plant, mixed with water, spread and rolled to form a dense water-bound base material.

The aggregates are mixed with not more than 15 gallons of water per ton of mineral aggregates, hauled to the road, and by means of spreader boxes, uniformly spread upon the subgrade at a rate designated in tons per station. This mixture is then windrowed with a one-man pneumatic-tired grader of at least 15-foot wheel base. With this grader the windrow is carried across the roadway, leaving a portion of the material in an even layer. The remainder is carried back in the same way, leaving behind another layer. Recutting and spreading with the blade is repeated if a uniform spread with equal distribution of rock at the surface is not obtained. Watering of the spread and rolling is then begun. In general, from 7 to 18 gallons of water per ton of aggregate is thus added. A 10-ton roller is used for the first rolling to give compaction and to cause mortar to rise. Just as this mortar flushes into sight a 6 to 8-ton tandem replaces the heavier roller and completes the flushing of mortar to the surface.

It is important that the "slurrying," as this flushing is called, should not be carried so far as to leave a heavy covering of mortar over the rock, as this must be removed later, after drying, in order to get proper bond with the surfacing to be placed. To this end it is necessary to avoid the use of too much 200-mesh material, especially if rich in clay, the use of too much water applied on the road, and excessive rolling.

The crusher product for slurry base runs from a maximum of 2½-inch or 1¼-inch to dust, but is divided on a 3-mesh screen. The earth binder, chosen for its bearing value in "dry compacted" and "compacted and soaked" states, for its lack of swell when soaked and to a small extent for its cementing value, is combined with the crusher product, either at the grizzly

behind the first crusher or by separate elevator or chute leading to the separating screens. The combination weighed into the batch box from bins containing 3-mesh minus and 3-mesh plus material must contain between 7 to 14 per cent of 200-mesh material. The binder should be gritty rather than in the form of clay clods and preferably should grade from 3-mesh down. However, if properly broken into fine sizes during its progress through the plant, it may be in any form or sizes which gives a grading of the combined mix within specification limits and develops the qualities to which reference has been made.

The binder when mixed with clean sand and gravel must give a bearing value stability equal to 80 per cent of that for a good macadam road sample.

The Soil Testing Division of the State Laboratories at the Headquarters and District Offices carry out the necessary tests to insure the use of proper material.

## New Six-Wheeler Truck

A new 6-wheel truck, on which the drive is distributed to the front axle and the rear axle of the rear bogie to provide a maximum spread between driving points, has been announced by the Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Long Island, N.Y.

The four point positive drive is obtained through the use of three automatic lock or torque proportioning differentials. The center differential, located in the transmission, divides the power between the front axle and the rear axle; and the front and rear differentials divide the power between the right and left wheels of the front and rear axles respectively. These differentials permit the necessary variation in speeds of the drive wheels due to rounding corners or to differences of tire diameters and still maintain positive driving action to all wheels at all times under all conditions.

The rear axle bogie provides parallel

wheel motion the same as independently sprung wheels used on many high grade automotive vehicles. The wheels on one side can tilt and rock without any motion, either vertically or otherwise, being transmitted to the wheels on the opposite side of the chassis. This unit has set-back front wheels providing a shorter wheelbase, the frame is of a drop-type being entirely straight behind the cab and has a loaded height of only 30 inches.

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The C7 Paving Breaker is a slightly lighter tool, and is well suited to average work. Then there is the husky middle-weight C11. At 54 pounds it is the most powerful breaker in its class. Model C10 is made with three styles of handles, as illustrated, and from this group a handy machine can be selected for demolition or other work requiring the operator to lift and direct the tool continually.

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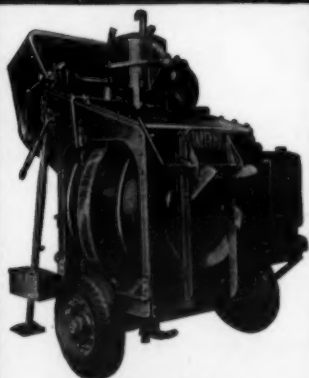
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# New Mexico Centralizes Maintenance of Roads

## Work in Various Districts Now Coordinated in Central Office Makes Possible Well-Maintained Roads

By B. G. DWYRE,  
Assistant State Highway Engineer in Charge of Maintenance

THE first of last year the New Mexico State Highway Department was partly reorganized in order to provide a separate department in the general office to take charge of maintenance. Prior to this time the administration of maintenance had been under the direction of the District Engineers in charge of the different highway districts in the state. The tendency of this system was to set up a maintenance department in each highway district, operating independently of the rest of the state, and without the benefit of the knowledge or experience of the other districts.

Centralization of control of maintenance in the general office under competent engineering supervision permits maintenance procedure to be founded on comprehensive knowledge. Information is collected concerning the needs of each district, the maintenance equipment available, and the probable cost of the work contemplated.

A study of these facts permits the development of a definite program, providing for each road, according to its relative importance, the best maintenance possible within the limits of the funds available. Under this system it has been possible to coordinate maintenance work in the different highway districts in the State and the result has been a decided improvement of the roads maintained and a more equitable distribution of funds.

New Mexico is next to the youngest State in the Union, having been admitted to statehood in 1912. It ranks fourth in area, forty-fourth in population, and has a registration of approximately 82,000 motor vehicles.

The total revenue available for the building and maintenance of all roads is derived from motor vehicle license fees, motor vehicle mileage tax, and a gasoline tax. From these sources there is available for maintenance purposes approximately \$1,250,000 per year.

### The Highway System

The New Mexico State Highway system embraces a total of 6,509 miles, of which 5,618 miles is under full time maintenance, and 891 miles is under part

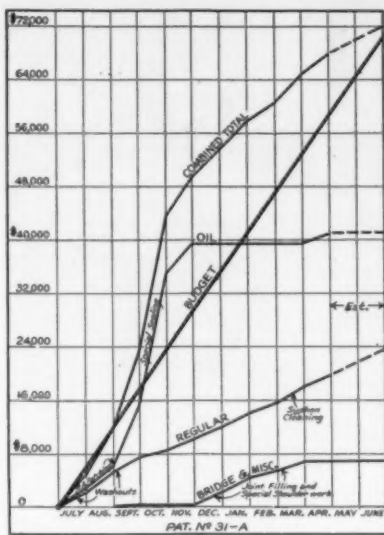
time maintenance. The full time maintenance is divided by types as follows:

Cement concrete pavement.....	107.19 Miles
Bituminous types.....	1,511.97 Miles
Crushed gravel and stone.....	1,624.28 Miles
Earth graded.....	2,374.63 Miles

The part time maintenance is divided by types as follows:

Bituminous types.....	4.5 Miles
Crushed gravel and stone.....	33.2 Miles
Earth graded.....	833.8 Miles

To supply the necessary preliminary information to work out a field organization, a maintenance map was made showing the highway districts and dividing each into maintenance patrols. The patrols were laid out with respect to local conditions and average approxi-



Monthly Maintenance Costs Plotted With Budget Allowance

mately 75 miles in length. Each patrol

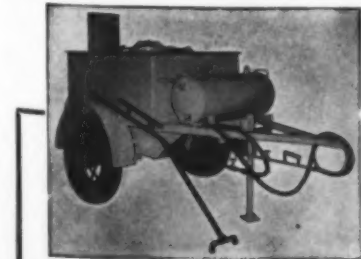
is in charge of a patrol foreman, with a crew of from three to five men.

### Equipment

The ultimate aim of the New Mexico State Highway Department in equipment for maintenance is to provide each maintenance patrol with a one-man motor grader for top maintenance on the graded and gravel types, and a small dump truck for patching and miscellaneous work on all types.

It is also planned to furnish each highway district with a small power shovel for general maintenance, and a sufficient number of large pull-type graders and tractors to take care of all grading work in the district. These units will work when and where needed in the district, and independent of the maintenance patrols. Each district will also be furnished with the necessary equipment to take care of all bituminous and concrete road maintenance, except patching, which will be taken care of by the maintenance patrols. These units will also

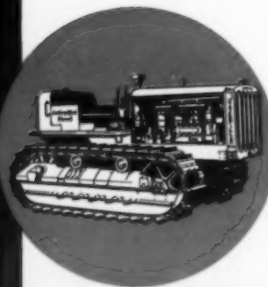
(Continued on page 34)



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A Waupaca County, Wis., Tank Truck Fills Up at the County Gasoline Station

### New Tanker Speeds Up County's Oil Distribution

The addition of a new FWD oil distribution unit has speeded up the fuel servicing of the highway equipment of Waupaca County, Wis., by 100 per cent, according to Charles Larson, Highway Commissioner.

From its own gasoline bulk station at Waupaca, the county dispatches the tanker to its sixty pieces of equipment operated in road building, maintenance, snow removal and other work.

The tank of this truck, which is made by the Four Wheel Drive Auto Co., Clintonville, Wis., holds 600 gallons and is equipped with an automatic measuring pump whereby any desired amount of gasoline can be dispensed. This feature, plus the speed and quick maneuverability, is claimed to have saved delay and expense in handling the county's gasoline requirements which total over 267,000 gallons yearly. Under the old system, fuel was distributed in 5-gallon cans carried on trucks.

### Lincoln Has Sales and Mfg. Rights of Oxygen Machine

J. F. Lincoln, President and General Manager of the Lincoln Electric Co., of Cleveland, Ohio, has recently returned from Germany where he completed negotiations with the Messer Co., Frankfurt on Main, for the sales and manufacturing rights in this country of a new type of machine for making oxygen for

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### Dry Weather Adds to Bill For Maintenance in Minn.

The extended dry period this summer has increased trunk highway maintenance costs on gravel roads in Minnesota by at least \$200,000, according to an estimate by N. W. Elsberg, State Highway Commissioner. Besides adding to the cost of maintenance, the long dry spell has made it impossible to keep the gravel roads in standard condition, and has also increased the danger of fast driving, Mr. Elsberg said.

There are nearly 5,000 miles of gravel roads in the Minnesota trunk system which require considerable moisture during the summer months to keep them compacted and permit satisfactory blading or smoothing operations. They are now so dry that blading leaves a soft mulch on the surface which is rapidly thrown off the roads by traffic and wind. However, blading is required frequently because of the bad washboard surface which forms on the hard, dry surface.

The loss of gravel from the roads this summer was abnormally high and will result in a heavy money loss. It has also cost much more than usual for dust laying treatments on trunk roads through the smaller communities. To put a dust layer on all the gravel roads in the state would cost more than \$2,000,000 for one season.

The dryness has also affected construction as well as maintenance. It has been almost impossible to compact new grading and graveling which in many cases remain soft and difficult to drive over, conditions which can be remedied only by rain.

### Osgood Moves Phila. Office

The Philadelphia office of the Osgood Co., of Marion, Ohio, has been moved to Room 126, Wilford Building, N. E. Corner, 33rd & Arch Streets. James C. Hoag, who has been District Manager in Philadelphia and adjacent territory for some time, continues in charge.

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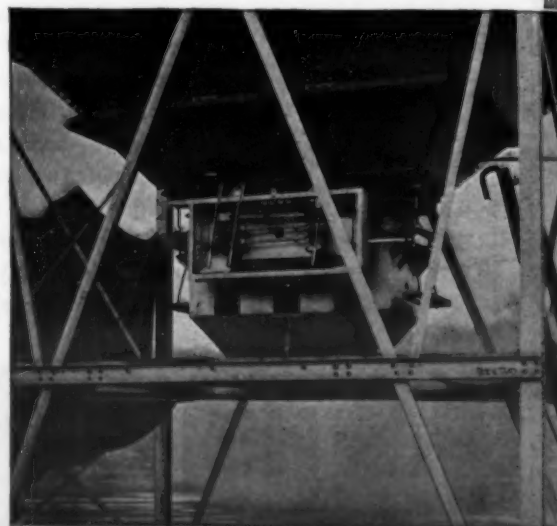
Descriptive literature and prices will be furnished on request.

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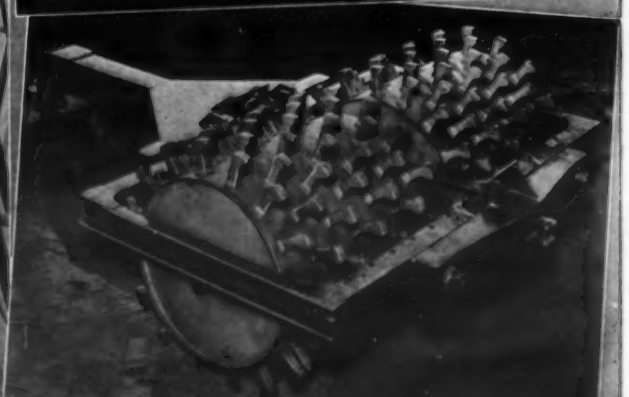
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**ROAD FINISHERS**  
Gas and Gas-Electric Types



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## Air, Suction and Water Hose for Contractors

No matter what kind of hose a contractor is using, it is treated to unusually severe service out on the job. Air hose is dragged around and subjected to extreme vibration where attached to a jackhammer or wagon drill; suction hose may lie around for weeks without being used, be subjected to all kinds of pounding but still it must be in shape when needed to unwater a trench or pit; water hose for pavers or for sprinkling service is dragged around and made to take about the worst abrasive wear of any accessory used on a construction job. The Gates Rubber Co., Denver, Colo., makes rubber hose for the different services, building the hose to suit service conditions.

Its air drill hose for heavy-duty compressors is of braided construction with an unusually thick non-porous tube made of rubber highly resistant to oils. The carcass is made of braids of high tensile strength cord with heavy rubber friction between the braids, to insure maximum adhesion, yet the hose is extremely flexible. The cover is acid and abrasion-resistant, tear and snag-proof and extra thick. The wrapped construction type of air hose has multiple plies of heavy square woven duck for the carcass in place of the braids.

The smooth bore suction hose particularly adapted to sewer and trench work and for use with diaphragm pumps has a tube with a spiral winding of heavy round galvanized steel wire covered with an abrasive-resistant rubber tube. The carcass is composed of plies of heavy square woven fabric with a tough, abrasive-resistant extra thick cover. The ends are rubber-capped.

Heavy-duty water hose for contractors is made from  $\frac{3}{4}$ -inch to  $1\frac{1}{2}$ -inch inside diameter of braided construction as well as of wrapped construction. On the first the tube is non-porous rubber, extra thick, with a carcass of braids of high tensile strength cord bonded with tough age-resisting friction material. The cover is of red rubber built to resist weather and heavy abrasion. In the wrapped type, the carcass consists of plies of heavy square woven duck especially selected for its strength and ability to resist high pressures. The medium pressure hose is made from 1-inch to 3-inch inside diameter with a heavy elastic rubber tube and a carcass of plies of strong hose duck bonded together by special friction stock. It has a grey rubber abrasion-resistant cover.

## Stress Distribution in Steel Rigid Frames

Progress Report No. 2 on Stress Distribution in Steel Rigid Frames compiled by the National Bureau of Standards of the Department of Commerce has just been published. This report gives the results of the tensile tests of the coupons for the rigid frame, No. 1, fabricated by the Bethlehem Steel Co., and also the stress distribution near the knee of this frame after the corner gusset plates had been removed.

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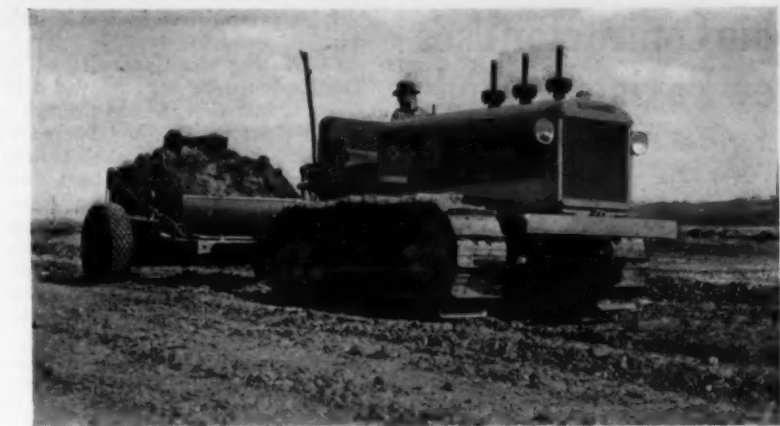
Tel. IRonsides 6-6600

Copies of this report may be secured from the American Institute of Steel Construction, 200 Madison Avenue, New York City.

## Controlled Ignition Diesel Fuel Tractors

New Model KO and LO controlled ignition diesel fuel tractors have been announced by the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis. According to Allis-Chalmers engineers, the features and improvements included in these models will enable the users to secure a maximum of diesel fuel economy.

A new type of fuel pump, a simplified injection system and new cylinder heads are a few of the improvements on these models. The new pump is simple in construction, easily accessible for inspection and adjustments and requires no special tools. Controlled ignition is another feature. Firing takes place at exactly the proper point, assuring com-



An Allis-Chalmers Model LO Tractor Pulling a 7-Yard Self-Loading Continental Scraper

plete combustion and eliminating power-wasting pre-ignition.

Both models operate on a wide variety of low-cost diesel fuels. The Model KO develops 49 horsepower and

the LO, 79 horsepower.

Complete information on these new models may be secured direct from the manufacturer by mentioning this magazine.

$\frac{3}{4}$  yd. LORAIN

**THERE IS NO OTHER MACHINE LIKE IT ON THE MARKET**

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★ BECAUSE no other machine has the sloping machinery frame (patents applied for) which is the greatest single factor in enabling the Lorain-40 to handle a  $\frac{3}{4}$  yd. dragline bucket or shovel dipper at a working weight and price approximating those of most  $\frac{1}{2}$  yd. machines... The new L-40 bulletin gives plenty of reasons why the Center Drive built L-40 is the fastest selling  $\frac{3}{4}$  yd. machine in the world today. Write for it.

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MOVE MORE MATERIAL, FASTER AT LOWER COST

## Ohio Contractor Uses New Paving Methods

(Continued from page 5)

French drains or other means of removing water from the subgrade. Where the new right-of-way was over heavily sodded areas the sod was disked and allowed to dry to kill the roots before any other work was done in preparing the grade.

The rough grading on this contract was done with a Thew 1-yard shovel loading to a fleet of trucks. All fills were spread in 9-inch layers by an Allis-Chalmers Model K tractor equipped with a Baker bulldozer. The final grade was made with an Adams blade grader pulled by the tractor. The fill was then disked with a tandem disc, weighing 1,500 pounds, to break up any clods and rolled with a Buffalo-Springfield 10-ton roller.

The fine grading ahead of the forms and the cutting of the thickened edge and form trench was done with a Warco power grader. A crew of seventeen men per shift with a foreman worked on fine grade and form setting. The contractor carried a line of Blaw-Knox forms on one side and a line of Meta-forms on the other side. The form trench was hand tamped to firmness before the forms were placed. The final subgrade ahead of the paver was rolled with a 3½-ton Fordson-powered roller.

### Batching the Aggregates

A complete batching plant was set up a few hundred feet from the south end of the job between two roads which forked at the beginning of the contract. River gravel from the Ohio River was furnished by E. T. Slider of New Albany, Ind., who hauled the material to a pit at the batching plant from which it was loaded to the batcher bins by a Koehring crane with a 45-foot boom and a Blaw-Knox ¾-yard clamshell. Sand was furnished by the same producer and also delivered to a separate metal-lined pit. The coarse aggregate, limestone, was furnished by the Sellersburg Stone Co., of Sellersburg, Ind., and delivered by truck to a third metal-lined pit. Adequate stockpiles were maintained against any temporary delays in delivery of aggregates. Two batchers were used, a Butler bin and batcher for the rock and gravel, and a smaller unit made by the Finn Equipment Co., Cincinnati, Ohio. The scales on both batchers were Gwynne units.

The individual batchers were weighed out with 1,230 pounds of sand, 843 pounds of crushed limestone and 1,265 pounds of gravel. From the batching plant the two-batch trucks drove about ½ mile along the right-of-way to a siding where several cars of cement could be spotted. Three men worked in the cement car loading the six bags of Speed cement to each batch. There were about ten trucks in the hauling fleet.

Water for the paver was furnished by a 2½-inch line attached to a city hydrant with the pressure boosted by a Domes-

tic triplex pump driven by a Wisconsin motor.

### Placing the Concrete

The batch trucks, all equipped with dual pneumatic tires, turned through a break in the form line and backed to the paver. While waiting their turn at the paver skip, the cement bags were opened by one man and two others emptied them on the batches. One man on the shoulder picked up the sacks thrown out by the men, emptied and baled them for hauling them back to the cement cars by one of the service trucks.

At the skip of the 27E paver one man dumped the batches and cleaned the bodies of the trucks. The state specification requires a minimum mix of one minute but on this job the batches were uniformly mixed for 1½ minutes. The paver pulled a Baker subgrade finisher which was driven by a Hercules power unit. The multiple cutting blades trimmed the grade to the neat line and tamped it with the plates behind each of the cutting blades operated by eccen-

trics from the main drive shaft. The contractor kept the fine grade high so that there was a considerable accumulation of earth in front of the cutter blades. Four men were used to shovel out the excess material and also clean out against the forms. Between the subgrade finisher and the strike-off described above was a 4-inch pipe and bolt scratch template which was pulled forward by hand every time the paver moved ahead. As the subgrade finisher was set to cut a bit low the scratch template had no chance to mark high spots in the subgrade. This made it necessary to place a slightly higher amount of concrete per linear foot of pavement than if the grade had been exact. It also made a slightly smaller yield for the batches than the theoretical figure.

Two puddlers spread the concrete placed by the paver operator and two others watched the wave of concrete ahead of the back screed of the Blaw-Knox electric finishing machine. The machine also carried a 15-inch canvas belt operating behind the back screed.

Attached to the back of the Blaw-Knox finisher was a cutter wheel for dividing the aggregate to permit easy placing of the center strip. The cutter wheel was furnished by the Flexible Road Joint Machine Co.

### Reinforcing and Expansion Joints

The reinforcing for the standard concrete pavement in Indiana as used on this contract includes fabric reinforcing and dowels across the center joint but no marginal bars. The dowels are placed 3 inches below the top of the forms by pressing them 1 inch into the concrete as struck off by the machine described. These dowels are 4 feet long of ½-inch round deformed bars and spaced 5 feet apart. The fabric reinforcing is placed on top of the concrete and dowels in two sections. The pair of men shoveling along the forms handed in the fabric to the pit men who, wearing rubber boots, placed it. The fabric was placed so as to leave 3 inches clear at the forms, and 3 inches on either

(Continued on page 25)

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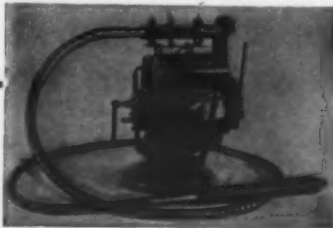
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## How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors



C. & E. M. Photo

The Handy Utility Car Used by S. J. Groves & Sons

### Utility Car Rides the Forms

**386** On almost any concrete paving job there are many odds and ends to be taken care of in the way of tools and small items of materials as the fine grading progresses. On the S. J. Groves & Sons contract for the construction of 12 miles of concrete pavement south of New Lisbon, N. J., the utility car illustrated was used to great advantage by the two men setting the beam-type expansion joints. There was an unusually large number of parts needed in assembling these joints and some kind of vehicle that would always be close at hand was needed to store and move them.

The car is simple in construction, consisting of two pairs of wheels from some discarded machine supporting a framework of wood selected from the waste pile but used with an eye to the particular service the vehicle was to render. A shelf here and a rest there took care of small parts and the structural members of the joint and the premoulded expansion joint material had a shelf of its own so that it would not become deformed or broken when moved. A tool box, with a lock, took care of the small shovel, special wrenches and the special clips needed to hold firmly the supporting angles of the joint in place.

This is just one of many utility cars we have seen on various jobs but it deserves especial mention because it was not just thrown together but rather designed to be sturdy and serve the special needs of the expansion joint men.

### Concrete Shed Protects Motor

**387** During the paving of the Scenic Drive, at El Paso, Texas, aggregates were quarried by the Dudley Stone Co. from the mountain-side near the road. To protect a motor in the quarry from damage during blasting operations, a heavy concrete shed was constructed over it. Track-logs laid in a circle near the face of the quarry also facilitated operations. The tracks converged at the crushing plant, which was located at the edge and just below the quarry.

### Saving Time in Cutting Curb

**388** While cutting concrete curbs for new street intersections in Denver, it was found that stone cutter's methods would save much time and leave the broken concrete in square blocks, easy to load and admirably adapted to re-use in building rip-rap, rubble walls, etc. The curb was marked off the length of the cut, then transversely in convenient blocks for handling. By striking a sharp steel bit with a sledge the concrete was checked continuously along the longitudinal line, perhaps 1/2-inch deep. Next the bit was forced deeper, at intervals of a few inches, moving from place to place and striking only a few light blows at a time. This gradually made a straight crack along the marked line, finally breaking out the entire block, or several

feet of it as desired. It was then broken up at the transverse lines in the same way. This may seem slow, but actually it is much faster than breaking the concrete into small irregular chunks.

By using properly shaped chisel bits, and keeping on the move so as to keep the crack running straight, it seems reasonable that this method can be profitably employed with a paving breaker, as well as by hand. If held too long in one place, however, the tool might break up the curb into irregular pieces.

### For Quick Eye Protection

**389** By sewing a pair of good goggles to the under side of his cap visor, a workman can avail himself of their protection at a moment's notice, yet he can as quickly remove them from his eyes when they are no longer needed. Many eye injuries have been sustained because the workman's goggles had been laid aside and he did not take time to recover them.



This Grizzly Eliminates Oversize Stone As It Is Loaded

### Truck Grizzly Sizes Stone

**390** While excavating stone at Pilot Knob, near Winterhaven, California, for use in paving U. S. 99 at that point, the V. R. Dennis Construction Co., of San Diego, used grizzlies mounted on trucks for hauling rock from quarry to crusher. This eliminated stone that was too large as it was loaded by the Lorain 75 shovel.

Harlem Boulevard, Rockford, Ill. Tarvia-built in 1922. The slightly granular surface of the road is as effectively skid-safe today as it was fourteen years ago.



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## Flood Control Work Near Los Angeles

(Continued from page 1)

tion for the channel was complete. This caused some damage to the manholes as the work was completed but not sufficient to delay the work. At another location a 24-inch sewer had to be relocated for 200 feet along the trench. Two 20-inch steel pipes were laid temporarily to care for the flow until the backfill was complete and consolidated and then a new pipe sewer was laid, profiting by the experience with the other sewer. Several sewers were carried under the channel in siphons with success, the work being done before the invert slab was poured and the drains had been laid.

The water main for Beverly Hills ran directly across the line of the new channel so it was necessary to carry it across in a temporary line until the channel was completed. This was done by the water utility, using a 10-inch steel line suspended by means of a catenary with eight steel wire cables as hangers for the pipe. The 95-foot clear span of the line from pier to pier was covered with only two pipes and a long sleeve at the center. Intermediate connections were welded to eliminate the extra joints.

There were several artesian wells on the job which developed as the work progressed. One which was brought under control with a 10-inch casing was located directly beneath the wall and for a time was a problem as to whether it should be run outside the concrete structure, into the channel or sealed as was finally done. Other artesian wells were similarly treated as they came to light. The water in all of them was very hard and not of a quality that would have made connections to the surface for domestic or industrial use worthy of consideration.

### Drainage on the Job

When excavation had been completed in the channel and just before the invert slab was poured, three parallel drains were laid beneath the slab elevation and covered with crushed stone. The 6-inch agricultural tile was below ground water level in most of the work and consequently at the time the work was underway ran quite full of water. The tile was covered with the paper from the cement bags at the joints and for the entire length to prevent any of the concrete poured for the slab running into the drains and permanently blocking them. The work was divided into sections ahead of the concreting and the water from the drains permitted to flow into sumps from which the accumulated water was pumped. This permitted the concrete crews to work in areas that were entirely dry except for the small amount of local drainage.

Several batteries of pumps were used along the line of the work to drain the water away from the active areas. At the extreme upper end of the project where it connected with an earlier project of the Los Angeles County Flood Control District, a sand bag dam was erected across the end of the invert and the water pumped out into a sewer so as to keep the upper end of the new work dry. Two 6-inch pumps, a Gorman-Rupp centrifugal with Hercules power and a Sterling centrifugal with Waukesha power, were installed in a pump shed on the bank and operated continuously. On a few occasions when a heavy flow came down the channel, the sand bag dam was topped, but only for a few minutes during the peak of the flow.

Along the channel, individual and groups of centrifugal and diaphragm pumps kept the excavation and sub-grade dry. These effective drainage agents included a Domestic double-diaphragm pump powered with a LeRoi

engine, a Gorman-Rupp 6-inch centrifugal with Hercules power, and a half dozen Sterling 2-inch centrifugals.

### The Concrete Invert Slab

The invert slab with which the first 8 inches of the wall was integral, was poured in two sections. The first strip, 25 feet 4 inches wide, was poured for as long a distance as possible and allowed to cure so as to provide a roadway for the batch trucks for pouring the balance of the slab which was 77 feet maximum inside width. The channel was reduced from 77 feet to 60 and at the uppermost section to 39 feet. The initial strip was poured from the bank with the Ransome 27E paver delivering to chutes. This same method was used for the narrowest section at the upper

end of the work. For the balance of the work the paver ran on the first strip poured and the batch trucks ran down ramps left at convenient points for access to cross streets.

The invert slab, after the initial strip, was poured as a continuous slab with transverse expansion joints at 30-foot intervals. These consisted of a 1/4-inch premoulded expansion joint material with an asphalt seal. The joint was cut to fit the thickened edge of the slab which was 1 foot 10 inches thick at the wall and a uniform thickness for 3 feet 6 inches, reducing to 1 foot 4 inches in the remaining 12 feet to the center of the slab. The slab, at the maximum section, contained 95 cubic yards of concrete per 30-foot section.

Keyways were cast in the slab, one

at each edge of the slab and the others spaced at 12 to 13 feet. These keyways are for the walls to be poured later to the same height as the outside walls. The reinforcing steel was bent up at the keyways to bond the walls with the invert. The concrete under the keyways and in the wall was consolidated with electric vibrators of the portable type.

The concrete mixed in the Ransome paver was placed in the slab by delivery of the 5-sack batch to a 1-yard concrete hopper on four legs which was swung from the paver chute to the place where desired on the slab. The Osgood crane with Cummins diesel power moved along with the paver and with its 50-foot boom reached across the mat of heavy reinforcing and spotted the hop-

(Continued on page 36)

## VIBRATION

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In the construction of a new two-lane highway on U.S. 30 across northern Indiana, the Controlled Ignition Oil Tractors of J. C. O'Connell work 14 to 21 hours a day. Above is one of Model "L-O's" with yard Continental S. er. Below is a Model "K-O" leveling the ground.

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## Sponge Rubber Joints Used for Overpass

The new Express Highway which is being constructed in St. Louis, Mo., by the Missouri State Highway Department is depressed with various cross streets bridging it, with the result that considerable attention has been given to bridge and retaining wall construction, from the standpoint of durability and appearance. Highway officials were anxious to secure an expansion joint material for this job which would not be affected by the heat and which would be as inconspicuous as possible.

After careful experimentation, sponge rubber was chosen. This material consisted of a sponge rubber made espe-

cially for this service by the B. F. Goodrich Co., of Akron, Ohio. Thicknesses of rubber, which vary from  $\frac{3}{4}$  to 1 inch, are determined by the Highway Department in writing the specifications for each particular job, and are based on the cubic content of the individual sections of concrete. The thickness of rubber is designed to allow for 50 per cent compression as the concrete sections expand in hot weather. All of the sponge rubber is furnished in a color which matches that of the finished concrete, making the joints as smooth and unobtrusive as possible.

A  $\frac{1}{4}$ -inch thick sponge rubber of similar design and color is also being used for expansion joints between the various sections of the concrete bridge railing.

## President of Blaw-Knox Dies

Irvin F. Lehman, President and one of the founders of the Blaw-Knox Co., Pittsburgh, Pa., died on August 5 after a prolonged illness of several months.

Mr. Lehman was born and educated in Pittsburgh, and there organized the Knox Pressed & Welded Steel Co. which in 1917 merged with the Blaw Steel Construction Co. to become the Blaw-Knox Co. He was Vice President of this company for many years and two years ago became its President. Mr. Lehman held many other business posts and was active in the operation and development of many allied companies, including Blaw-Knox Ltd. of London, the Compagnie Francaise Blaw-Knox of Paris, and the Blaw-Knox International Corp.

## Plant-Mix Road Built in Nevada

(Continued from page 7)

fill slopes and deposited at inconspicuous places.

Imported borrow material was secured principally from inlet and outlet ditches. All embankments, including portions built with imported borrow were placed in layers, watered and rolled in accordance with standard specifications.

### Construction of Sub-Base

A sub-base consisting of materials conforming to the specifications regulating crushed gravel and stone base, was used.

Grading of the material for the sub-base was classified to conform to the following requirements:

Passing screen with  $\frac{1}{8}$ " circular openings 100 per cent  
Passing 3-mesh sieve, square openings 35-60 per cent  
Passing 200 mesh sieve, square openings 0-10 per cent

Two suitable deposits of material were drawn upon for supplies of crushed gravel, or stone sub-base, plant-mix crushed gravel base, plant-mix surfacing and selected borrow. One of these deposits was found 500 feet from the right-of-way and the other 1,700 feet distant.

Rolling of the sub-base was achieved by self-propelled rollers exerting a pressure of not less than 350 pounds per linear inch of tire widths. Specifications required that such rolling be longitudinal and begin at the outer edge, progressing inward. Rolling was continued until the sub-base ceased creeping or moving under the weight of the roller. As a result the sub-base was completed with a firm, even surface and conformed to the grade established for the bottom of the base course.

### Spreading the Plant-Mix

A plant-mix material with a crushed gravel or stone base was called for in the highway department's specifications. Grading of this material, however, was slightly modified to meet the local conditions. The scale of gradation followed the formula:

Passing  $\frac{1}{8}$ -inch screen, circular openings 100 per cent  
Passing 3-mesh sieve, square openings 35-60 per cent  
Passing 200 mesh sieve, square openings 5-14 per cent

Filler used in the above specified material contained a cementing value of not less than 85 pounds per square inch.

After the filler had been properly placed and set a plant-mix asphaltic surface consisting of Type SC-4 material was used.

The base course, however, was given a priming coat of Type SC-1A asphaltic road material, prior to placing the surface course. After the mixed material had been spread and windrowed it was again spread from the windrows to final position in sections having lengths of not less than  $\frac{1}{2}$ -mile. Edges of the plant-mix surfacing were trimmed by hand holding true to the lines as shown on the plans.

A seal coat of Type MC-2 asphaltic road material was then applied to the finished surface.

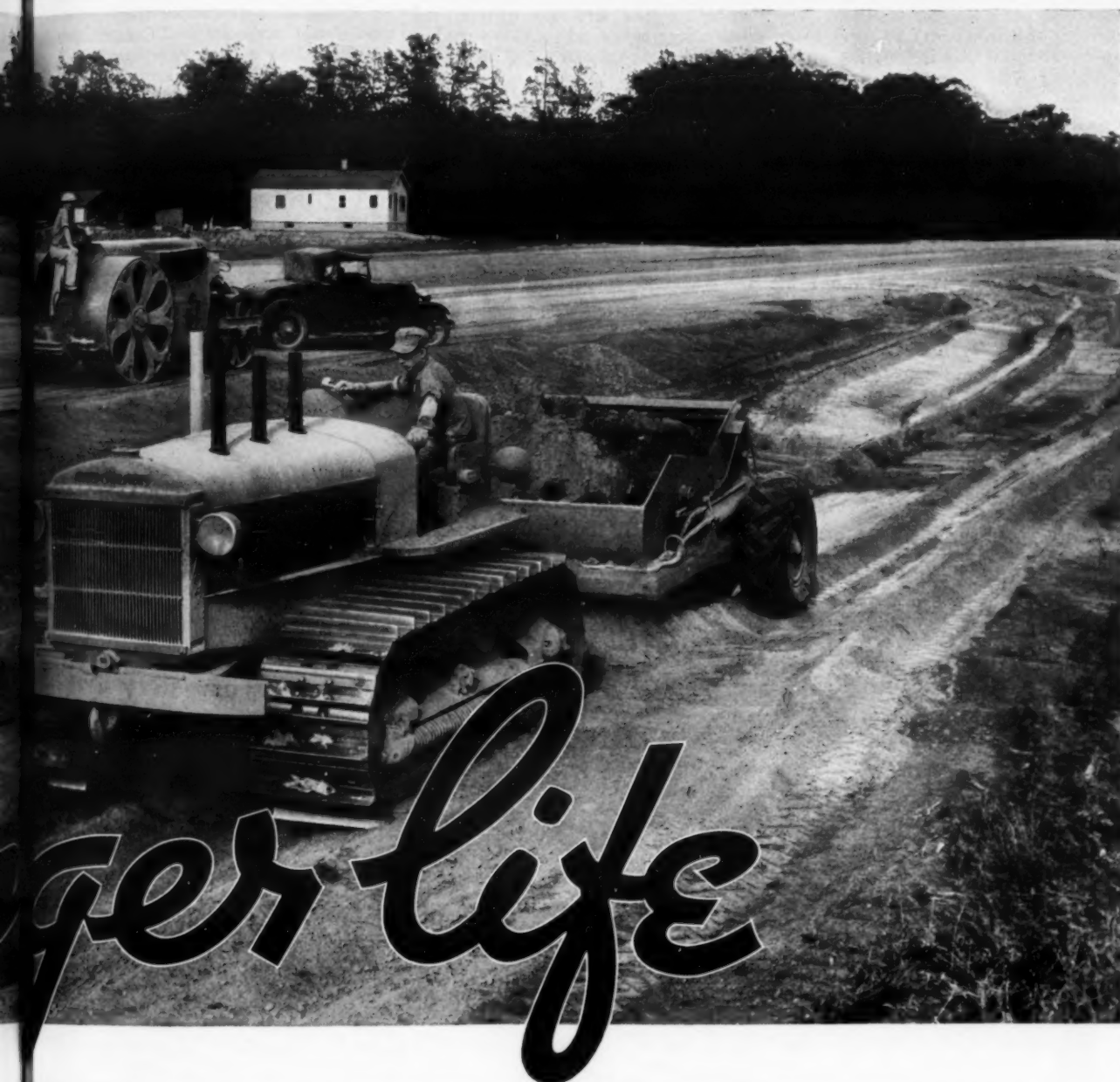
### Other Features of Work

Additional features of this phase of road construction included salvaging and relaying of the already existing asphaltic surface which was first scarified and the material then stockpiled adjacent to the roadway. After the base course was completed this stockpiled material was placed on the shoulders of the roadway and roughly shaped to line and graded.

Shoulders, extending 8 feet on each side were rolled and then given a seal coat of Type SC-1A asphaltic road material, laid at the rate of approximately  $\frac{1}{4}$ -gallon per square yard.

Traffic lines were placed and measured to meet standard specifications.

(Continued on page 27)



It is only natural that Controlled Ignition, with its low compression pressures and freedom from destructive vibration, should mean longer tractor life. A typical owner reports that after 7,000 hours of heavy work—in severe dust, 22 hours a day—he had not even replaced the original sleeves and pistons of his first Model "K-O". In a large logging camp—under the most abusive type of work—a fleet of Model "L-O's" worked 3,500 hours and still had their original pistons, sleeves, rings, valves, steering clutches, master clutches, brake bands, main and connecting rod bearings.

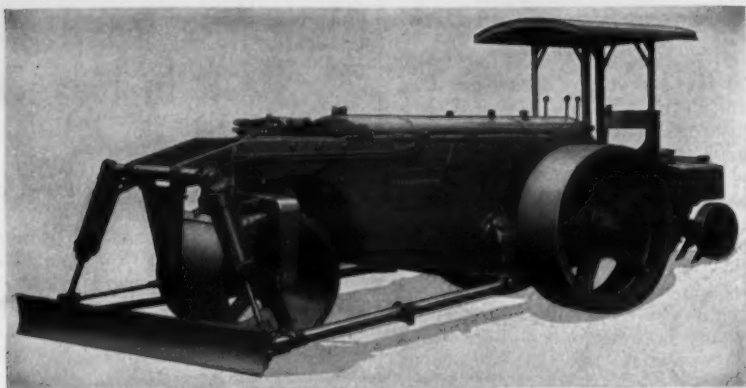
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The New Planer Attachment for Austin-Western Rollers

### A New Planer Attachment for Road Rollers

A new hydraulically-controlled planer attachment for use with 6, 7 and 8-ton road rollers has recently been announced by the Austin-Western Road Machinery Co., Aurora, Ill. The attachment consists of a 7-foot blade and is designed for use in finishing subgrade and other types of grading where rolling is required. A 2-foot extension may be added at either end if desired. The blade bit is reversible.

The blade may be set to remove excess of material at any height and may be set straight across the machine or angled to allow material to windrow to the left of the roller. Rapid vertical adjustment is assured by an hydraulic control valve operated from the roller platform, responding instantly to the touch of the operator.

The manufacturer claims that the principle of operation is parallel to that of the third axle center roll of their Roll-A-Plane, since by placing the heel of the planer on the same plane as the front and rear roll, three points are established in the same plane. As a result, the high spots are found and leveled off by the action of the planer to create a level surface.

### Mixing and Curing Water Controlled by New Meter

With the present trend toward demands for the accurate measurement of mixing water, particularly for water-cement ratio control, the Spangler Mfg. Co., 623 E. Third St., Los Angeles, Calif., has announced a metering valve for concrete mixers which it claims has an accuracy of 1 per cent. This meter is easily installed on any concrete mixer and is completely automatic in operation. The delivery volume can be conveniently changed by a simple resetting of the dial.

The accuracy of measurement is secured by mechanically proportioning the hydraulic displacement in the valve and calibrating the meter in the factory laboratory. The complete cycle is automatic and is started by throwing the operator's lever or, in electrically operated batching plants, by simply pressing a button. The meter is manufactured in several sizes, permitting the delivery of water in any desired quantities.

A recent use of the meter in con-

junction with a Spangler timing clock is for automatically delivering curing water at predetermined intervals. The periods of delivery may be set in 1-second increments and the shut-off predetermined to cover an entire 24-hour cycle.

### The Rejuvenation of 30-Year-Old Viaduct

The Intercity Viaduct, connecting Kansas City, Kans., and Kansas City, Mo., has been a traffic bottleneck for years. This structure, 1 $\frac{1}{8}$  miles long, built in 1905-06, was only 36 feet wide which was entirely inadequate for present day traffic. But things are going to be different this fall for the bridge is being widened to 46 feet, the project being carried out jointly by the state highway departments of Kansas and Missouri.

Considerable reinforcing is being done to the bridge to enable it to carry the increased load. Five hundred and forty stiffeners are being welded to the main load-carrying members. To strengthen the structure further, the heavy floor beams, which were found to be weakened by corrosion, are being reinforced by welding steel plate to them. Support for the 4-foot sidewalks

on the north side of the bridge is being provided by a 12-inch stringer, arc-welded to clips attached to the beams. Approximately 16,000 feet of guard rail is being added to the bridge. This rail, requiring approximately 350 tons of steel, is being shop fabricated by arc welding by the Builders Steel Co., North Kansas City, Mo., who is also supplying a large part of the steel for the project. The rail is built up in sections, averaging 15 feet 3 inches in length.

A special jig is used to hold the channels and bars securely in place for welding, thus eliminating the need of tack welding. With the use of this jig, two operators and one helper who fits the parts together complete 20 sections of rail a day.

The contract for the remodeling of the bridge was awarded to M. E. Gillioz, of Monet, Mo., who sublet the erection of the steel to the Stroebel Construction Co., of Chicago, which company is also doing the welding, using Lincoln Shield Arc welders and Fleetweld electrodes.

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in-head engine and many, many modern mechanical refinements that assure utmost economy, performance and reliability. There is, likewise, advanced streamlined styling which sets it apart as a truly distinctive vehicle. And available for this 3-ton GMC is the all-steel "helmet top" cab—a rugged, roomy, comfortable and weatherproof driver's compartment if there ever was one.

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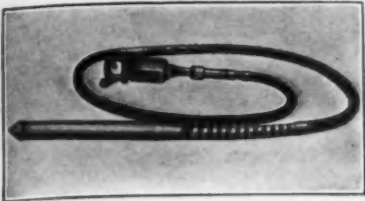
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Weight only 11 $\frac{1}{2}$  lbs., yet very strong

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The Mall Air Vibrator

### New Type of Vibrators Added to Line

The Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill., has announced the addition of several new types of vibrators to its present line of equipment. These vibrators include several three-phase and single-phase electric models for operation at 4,500 rpm, 5,500 rpm and 7,000 rpm, a universal machine for operation at 7,000 rpm and an air driven unit which develops frequencies of 4,200 rpm at 80 pounds air pressure. All of these machines and the variable speed gas engine sets can be furnished with a size and type of vibrating element for each specific concrete placing problem.

Mall vibrators are made in three sizes, 1 3/4-inch diameter for small walls and concrete products, 2 3/8-inch diameter for medium sized walls on general construction, and 3 1/4-inch diameter for large walls and large masses of concrete.

Complete information on these vibrators may be secured by interested readers direct from the manufacturer.

### Wood Appoints Distributors

The Hoist & Body Division, Gar Wood Industries, Detroit, Mich., has announced the appointment of a number of new distributors to handle the hydraulic hoists and steel dump bodies to fit all types of truck chassis which are made by this company.

These new distributors are Shaw Sales Co., Billings, Mont.; A. Fassnacht & Sons, Chattanooga, Tenn.; Baker Equipment Engineering Co., Charlotte, N.C.; Lone Star Equipment Co., El Paso, Texas; Mississippi Truck Equipment Co., Inc., Jackson, Miss.; C. W. Rathbun Co., Oklahoma City, Okla.; Allison Steel Mfg. Co., Phoenix, Ariz.; Felt Auto Parts Co., Salt Lake City, Utah; Union Iron Works, Spokane, Wash.

### Paper on Carbonation of Unhydrated Portland Cement

Building Research Technical Paper No. 19 of the Department of Scientific and Industrial Research of Great Britain, entitled "The Carbonation of Unhydrated Portland Cement" which was recently issued, contains the results of investigations undertaken to determine the effect of various conditions of storage on the properties of modern cements.

Copies of this bulletin may be secured from the British Library of Information, 270 Madison Ave., New York City. Price: 35 cents.



### New Sinker-Type Drill

The new Hardsocg WS drill, recently announced by the Hardsocg Wonder Drill Co., 227 S. Benton St., Ottumwa, Iowa, is a fast driller, designed for any depth of hole for which hand drilling would be considered. It is operated by a spool valve and the operating and throttle valves are embodied in the main forgings, giving the whole drill a streamlined effect.

The drill is made of forgings throughout, with all parts of special analysis steel, heat-treated for their particular service. The handle is offset just enough to give the drill balance in operation and when properly held to its work, there is no lateral vibration. It has a strong rotation and is fully air-cushioned.

This drill weighs 60 pounds, is 20 1/2 inches long and unless otherwise specified is equipped for 7/8-inch x 3 1/4-inch shanks. It can be fitted for 1-inch x 4 1/4-inch shanks when so ordered.

Complete information on this new WS drill may be secured direct from the manufacturer.

### Another Grade Crossing Eliminated in St. Louis

The program of grade crossing elimination to increase the safety of the motoring public goes on as fast as possible. A particularly dangerous crossing is now being eliminated in St. Louis, Mo., at the intersection of the Missouri Pacific Railroad and Ivory Avenue and Poepping Street, which is being accomplished by depressing Ivory Avenue.

The open concrete underpass will be 56 feet wide, leading to and from the railroad tracks and 42 feet wide underneath the tracks. Provision is being made for four traffic lanes.

Condon, Cunningham & Lemon, contractor of Kirkwood, Mo., has the contract for the concrete work and the Atkinson Paving Co. is laying the pavement. The Smith-Brennan Pile Co. of St. Louis has driven 5,600 feet of piling for the concrete walls.



(Above)  
Snow Removal—This Carryall is clearing a city street of snow, enabling business to move on as usual. Many a contractor last winter used Carryalls to clear snow from borrow and gravel pits so work could go on profitably.

(Right)  
Bank Sloping—Le Tourneau Carryalls, thanks to a low center of gravity, can work on slopes of 3 to 1, finish to almost any desired grade with little or no hand work.

(Left)  
Backfilling to a Culvert—Because the wheels are mounted inside the cutting edge ends, Le Tourneau Carryalls can get in close to culverts, spread in thin lifts and so leave a compact backfill.



Fractional-Inch Spreading—Positive tailgate unloading enables the Le Tourneau Carryall to spread in any desired lift from one inch to one foot. As a result of this spreading accuracy and the sureness with which the blade can be controlled, Le Tourneau Carryalls are frequently used for finishing work.

## EXTRA PROFITS FROM CARRYALL VERSATILITY

On hundreds of construction jobs the country over, Le Tourneau Carryalls are cutting costs by moving dirt cheaper than is possible by any other method now available. To these low earthmoving costs, many an imaginative owner adds extra profits by using his Le Tourneau Carryall to handle incidental work usually requiring special equipment or the use of much hand labor, such work as stripping brush from borrow pits, finishing grades, bank sloping, backfilling, loading trucks from ramps, snow removal. A versatility born of correct, job-proved design, stout construction and powerful, trigger-quick cable control makes possible the handling of these extra jobs, makes possible the fast, economical movement of big yard-ages by Le Tourneau Carryalls.

Ask your Caterpillar tractor dealer to show you what Le Tourneau Carryalls can do on your job.

### R. G. LE TOURNEAU, INC.,

Peoria, Illinois

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BULLDOZERS • CARRYALL SCRAPERS • CRANES •  
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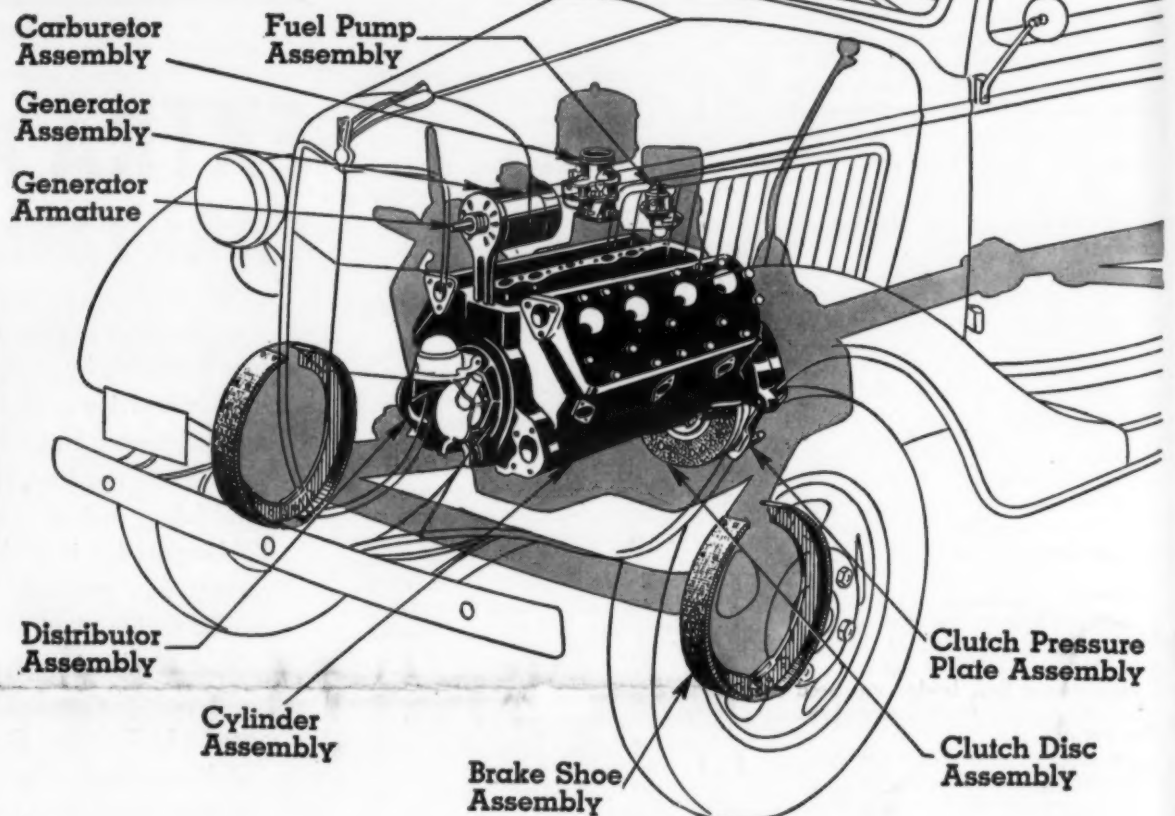
# LETOURNEAU

# Ford Exchange Plan

## HELPS REDUCE HAULING COSTS FOR CONTRACTORS

### FORD ANNOUNCES NEW DE LUXE EQUIPMENT FOR TRUCKS AND COMMERCIAL CARS

Low additional cost. See your Ford Dealer for full details and prices.



LOW MAINTENANCE COST is one of the important all-round economy advantages of Ford V-8 Trucks and Commercial Cars. Cost records of owners prove this. And one of the chief reasons for this saving is Ford's engine and parts exchange plan.

After tens of thousands of miles of reliable, economical service, the Ford V-8 engine can be exchanged for a block-tested, factory-reconditioned engine (cylinder assembly, including heads). This money-saving Ford feature restores original high efficiency to the Ford V-8 Truck or Commercial Car at a cost much lower than an ordinary engine overhaul. The exchange can be made in a few hours, reducing the unit's idle time. The reconditioning is done by the same precision methods and with the same high-quality parts used in manufacturing the engine originally.

This is but one of the many exchange items which Ford offers. Generators, distributors, fuel pumps,

carburetors and many other reconditioned parts are also exchangeable at low cost.

These exchange privileges are but a part of the Ford story of low up-keep cost. V-8 economy is OVER-ALL ECONOMY. In addition to low-cost maintenance, it includes low first cost and low operating cost.

Call your Ford dealer today and set a date for an "on-the-job" test of a Ford V-8 Truck or Commercial Car with your own loads, under your own operating conditions. Find out what V-8 Performance and V-8 Economy can contribute to *your* business.

Any new 112-inch wheelbase Ford V-8 Commercial Car can be purchased for \$25 a month, with usual low down-payment. Any new 131½-inch or 157-inch wheelbase Ford V-8 Truck can be purchased with the usual low down-payment on the new UCC ½% per month Finance Plans.

# FORD V-8 TRUCKS AND COMMERCIAL CARS



## Ohio Contractor Uses New Paving Methods

(Continued from page 18)

side of the center and expansion joints.

The expansion joints were set in place immediately after the paver passed the point where they were to be installed. Translode expansion joints made by the Highway Steel Products Co., Chicago Heights, Ill., were used on this contract and were installed every 40 feet. This joint consists of Carey Elastite pre-moulded expansion joint material encased on both sides with 24-gage black metal with 12-inch sections of  $2\frac{1}{2}$  x 3-inch angle irons from which are cut three lugs about 3 inches long and  $1\frac{1}{2}$  inches wide at the angle and 2 inches wide where they are bent out to form a bond with the concrete of the slab. A round top cap protects the expansion material and during pouring another square top cap is also placed, which is later removed by the finisher. The joints were held in place during pouring by six pins of  $\frac{3}{4}$ -inch rods with the top bent over and a second short section of rod welded below to form a firm grip for the form and still have the pin a short distance from the joint to permit concrete to flow against the joint. Both sides of the joint were vibrated by a Master vibrator, the power unit for which was carried on the finisher.

### Finishing the Slab

After the Koehring longitudinal finisher had completed its work the hand finishers followed closely with their 10-foot checking straight-edges. One finisher checked from each side and then a Lakewood hand-operated belting machine was run over the slab before the brooming and edging. An old longitudinal float bridge was used by the joint finisher for his operations.

The wet burlap for the initial curing was carried on a metal-lined 4-wheel bridge running on the forms. Two men placed the burlap which remained on the concrete and was wet for 24 hours.



C. & E. M. Photo

The Straight-Edge Is Quicker Than the Eye at Checking Irregularities at the Joints

The following morning it was removed and the crew of men who pulled the forms and banked the sides of the slab with earth spread straw to a depth of 3 inches on the concrete. It was sprinkled for seven days and removed the eighth. A crew of eight men handled this work.

### Personnel

The contract for the 3.158 miles of

## A. R. B. A. Convention To Meet in New Orleans

The 1937 Convention and Exhibit of the American Road Builders' Association will be held in New Orleans, La., during the week of January 11, according to an announcement made by Charles M. Upham, Engineer-Director of the Association. This will be the first time the A. R. B. A. has held its convention in the South.

The 1937 program will be drafted

concrete paving of 9-6-9-inch section 20 feet wide between Jeffersonville and Watson, Ind., FA-398C, was awarded to the Wilmore Paving Co., of Middletown, Ohio, for \$91,081.13. For the contractor the work was under the direction of Tony Shebanek as Superintendent, who won his spurs as a Kentucky Colonel while handling paving contracts in the Blue Grass State. For the State the work was in charge of G. B. Schoolcraft, Project Engineer.

with the Convention as the central feature of the national highway conclave. No effort will be made to hold a heavy-equipment road show, but booths will be available to manufacturers of equipment and producers of materials who desire to exhibit models, materials and literature.

This convention will cover many new subjects of vital interest to those who are building and maintaining the nation's highways and streets. The highway program of the current fiscal year will involve the expenditure of more than a billion dollars. Congress has authorized Federal-Aid through the fiscal year 1939, thus providing an orderly construction program for the next three years. One of the new items that will enter into the two-year program beginning next year is the authorization made by Congress for Federal-Aid for secondary and farm-to-market roads. The coming A. R. B. A. convention program will include full discussion of policies proposed for the most effective application of these funds.

**"GOING IN FOR BIGGER PROFITS" ON A WIDER RANGE OF JOBS**

**RH MODEL 355**

**3/4 YD.**

● How many different sizes and kinds of jobs should a  $\frac{3}{4}$ -yd. shovel handle profitably? What is a fair cost per yard? ... per working hour? ... per mile of travel? How much is lost in idle time? How much in repair bills each year? Men who are shovel-wise know these costs! That's why they recognize the new Model 355 as a bigger money-maker. They can handle more jobs; move quicker from place to place, work faster, keep busier—earn more. If you want to see what all-welded construction with alloy steels has done for this new  $\frac{3}{4}$ -yd. machine compare your present costs, yard for yard, dollar for dollar of investment with the pacemaking production the Model 355 gives you. Write for complete details.

"Here's universally approved design — tractor-type crawlers for dependable travel at lowest cost. Resiliency in the track itself protects alloy steel shoes against breakage."



Bulletin X-10 describes the Model 355. Ask for your copy. A post card will bring it.

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**RH PACEMAKERS - FASTER ON THE JOB.**

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**With RAISING and LOWERING**

**BALANCED POWER HOISTS**

**ONLY ONE MOVING PART**

Balanced power for raising or lowering—automatic locking, any position—one moving part—no gears—no oil lines—no heating or foaming of oil. Plain and Braced Side Bodies—1½ and 2 Yard capacities.

**FAST! POWERFUL!**

**THE BURCH CORP.**  
Dept. J - CRESTLINE, OHIO

Write for Literature

## Scraper and Coal Make Checkerboard

Operation of 12-Yard Scraper in Ideal Material Speeds Work on 100,000-Yard Grading Job in West Virginia

(Photos on page 40)

IMAGINE yourself driving at a fair pace through the hills of West Virginia, swinging around the brow of a hill and seeing laid out below you a checkerboard of black and tan squares on a gigantic scale. If you were in the dirt moving game you would immediately realize that a "Cat and Scraper" operator was having a grand party, and that is just what was happening on Ralph W. Fimple's \$124,186.03 grading and paving contract on U. S. 250 south of Fairmont, W. Va. last summer. There was no money wasted and when an operator can amuse himself and get his work done all at the same time, there is no harm done.

The situation was this: There was a fill to be made to a depth of 55 feet 6 inches and with a maximum width of 125 feet. The earth for the fill was coming from a 36,000-yard cut at one end of the fill and about 12,000 yards from a smaller cut at the other end. As there was little rock, and that a disintegrated shale, in the cuts, a LeTourneau Carryall scraper pulled by a Caterpillar RD8 diesel tractor was put in to swing from one cut to the other, spreading the material as it crossed the fill. Now it happened that in the 12,000-yard cut there was a lot of poor coal that could not be used economically in any stove or boiler so it went into the fill in thin layers with dirt over it to prevent any chance of later spontaneous combustion. It was then that the genius of the operator came into being. He saw a couple of strips of the black material spread out over the fill with the dull dirt between. Then he became a little more careful just where he placed the black material so that before he had been working for many hours he had created a super checkerboard about 300 feet long by 125 feet wide.

The 12-yard Carryall made its round trips in about 6 minutes with full loads of material, spreading as it ran across the fill. The layers were further spread by a Caterpillar Fifty diesel tractor and LaPlant-Choate bulldozer, and then rolled by a 10-ton Hercules gas roller.

On one day when the three 7-hour shifts got away to a poor start because of wet material the contractor was able to put in 191 loads of 7 yards of material, bank measurement, or a full 12 yards in the scraper, in one day. The job was regularly run as three 7-hour shifts with three 5-hour shifts on Saturday to make up the 40 hours allowed the operators per week.

When the disintegrated shale seemed a little hard for the scraper to cut readily, the contractor put in a LaPlant-Choate roofer to loosen the material but the dirt prepared in this manner did not load as readily in the scraper as when the scraper cut the slice itself.

### Job Details

Hand labor on the job consisted of two men per day shift trimming slope. As they were green at cutting 1:1 slopes the superintendent made a slope board, a right-angle equal-legged triangle that was light and easy to handle and then on projections from one of the legs drew a cord across tight and on it hung a

Sands level. This served effectively as a guide for the green laborers. These same men did the greasing of the tractor and other equipment under the direction of the operators and the superintendent.

To provide sufficient light for work at full speed on the dark shift the contractor installed two 20-foot wood towers, one on the larger cut and the other on the fill. The former had one 300-watt light in a General Electric floodlight reflector and the other had two such lights.

The contractor was able to salvage considerable marketable coal from the smaller of the two cuts after the poorer material had been removed and used in the "checkerboard."

### Personnel

Carl S. Barnhart was Superintendent for Ralph W. Fimple of Fairmont, W. Va., on this contract, Project FA155-1 and C, calling for grading 30 feet wide for the 2.84 miles and an 18-foot concrete pavement of 9-6-9-inch cross section. W. C. Sandy was Inspector in

## Another 3/4-Yard Excavator

Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., has announced a new high-speed 3/4-yard excavator designated as the Model 355. It uses standard tractor crawlers of the type manufactured by the Allis-Chalmers Mfg. Co. All movements in travel and digging have two-speed transmission with a high-speed direct drive. Ease of control is obtained through the use of automotive-type foot pedals and larger brakes and clutches are provided for faster starts and stops. It has a full-vision cab.

The Model 355 has an all-welded dipper made of rolled steel with 3/4-yard struck measure capacity. It is available with light alloy steel attachments for service as a shovel, dragline, crane, skimmer scoop, trench hoe and pile driver.

Charge on the grading for the State Road Commission of West Virginia of which Mortimer W. Smith is Chief Engineer.

The enthusiasm of both contractors and highway officials for the new Etnyre distributor with the circulating, non-drip spray bar, is remarkable. Their acceptance of Etnyre equipment is evidenced by sales.

Write for descriptive literature



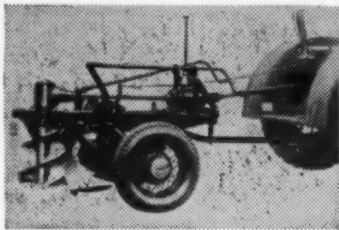
# E. D. ETNYRE & CO.

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST.

OREGON, ILL.

## PARSONS WHIRLWIND



Moves earth cheaper and quicker than any other machine of its size or for horsepower consumed. Suitable for terracing, ditch-cleaning, surface drains, and irrigation laterals, landscaping, golf course construction, etc. In fact a useful tool for grading or moving earth in shallow excavation anywhere.

Works behind any wheeled tractor preferably 15/30 H.P. with rear power take-off.

Already in use in nine states.

**THE PARSONS COMPANY**  
NEWTON, IOWA



# Plant-Mix Road Built in Nevada

(Continued from page 21)

Six detours were constructed and maintained during the progress of the work, which provided a smooth, dustless surface 20 feet wide to take care of the heavy traffic. Specifications limited the use of not more than three detours at the same time.

Type SC-2 asphaltic material applied in the quantity of 1/4-gallon per square yard, after blading, supplemented power scraper work and the use of imported borrow.

## Quantities and Prices

Item	Quantity	Unit Price
Removal of culvert pipe	266 linear feet	\$0.52
Removal of culvert head-walls	22	5.00
Roadway excavation	68,600 cubic yards	.34
Overhaul	47,505 sta. yards	.82
Imported borrow	35,259 cubic yards	.37
Structure excavation	1,540 cubic yards	1.00
Subgrade	15.13 miles	125.00
Shoulders	15.13 miles	125.00
Finishing roadway	15.13 miles	200.00
Crushed gravel or stone sub-base	63,200 tons	.50
Plant-mix crushed gravel or stone base	45,600 tons	.80
Plant-mix asphaltic surface	25,900 tons	1.03
Water	2,344,000 gallons	2.00
Type MC-2 asphaltic road material	90 tons	25.00
Type SC-2 asphaltic road material	1,295 tons	19.50
Type SC-4 asphaltic road material	445 tons	15.25
Type SC-1A asphaltic road material	422 tons	15.00
Class A concrete	592 cubic yards	23.00
Class B concrete	33 cubic yards	28.00
Reinforcing steel	63,962 pounds	.05
18-inch corrugated metal pipe, dipped	592 linear feet	1.95
24-inch corrugated metal pipe, dipped	988 linear feet	2.80
30-inch corrugated metal pipe, dipped	138 linear feet	3.70
36-inch corrugated metal pipe, dipped	264 linear feet	5.60
Relay culvert pipe, dipped	30 linear feet	.62
Move culvert headwalls	36	9.00
Monuments	109	3.00
Culvert markers	128	23.00
Salvage and relay surface	15.13 miles	470.00
Motor grader with pneumatic tires	400 hours	4.00
50-hp crawler tractor	400 hours	4.00
10-foot blade grader	400 hours	1.00
50-hp tractor with power scraper	200 hours	4.50
1 1/2-ton dump truck	300 hours	2.00
<b>Total</b>		<b>\$219,669.70</b>

## Equipment Used

Equipment used for building and maintenance of the detours consisted of: one 50-hp crawler type tractor; one 10-foot blade grader; one 50-hp tractor with 6-cubic-yard power scraper; one motor grader with pneumatic tires and 8-foot blade; and one 1 1/2-ton dump truck.



A Marmon-Herrington All-Wheel Drive Ford V-8 Truck Equipped with a Fruehauf Semi-Trailer and Wood 6-Yard Dump Body

An added feature of this construction job was the use of rubber-tired wheelbarrows for the excavation and grading work performed by hand labor. These rubber-tired wheelbarrows have been found very satisfactory to both labor and the contractor. Larger loads are carried with considerably less effort and exertion. The broad tread wheels offer less resistance in soft dirt.

## Labor

The contract specified that the work be completed within 200 working days from the date of award. No work was permitted on Sundays and nationally observed holidays.

As the job was a Federal Aid Project, the contractor was required to meet certain special provisions concerning rates of wages, hours of employment and selection of labor.

Nevada laws fix a rate of \$0.625 per hour for unskilled labor. An agreement between the Bureau of Public Roads and the Highway Department established a minimum rate of \$0.70 per hour for intermediate and \$0.90 minimum per hour for skilled labor. However, the Federal labor agreement enforced in the Boulder Dam area fixed

## All-Wheel-Drive Trucks Designed for Road Work

The Marmon-Herrington all-wheel-drive Ford V-8 line of trucks, which was introduced not long ago by the Marmon-Herrington Co., Inc., Indianapolis, Ind., is especially adapted for highway service, because of the added traction obtained by means of driving power through the front as well as the rear wheels.

Equipped with dump body and underbody scraper, such a unit can be used in the construction and maintenance of highways in the spring, summer and fall, and with the addition of a snow plow can be pressed into snow removal service in the winter.

A number of these units are in use by state highway departments as well as

a minimum of \$1.00 per hour for skilled labor. All of these conditions were applicable on this contract.

In view of the distances between communities, in this sparsely settled section of southern Nevada, the contractor was required to furnish satisfactory board and lodging for employees who did not wish to provide their own. Further provisions required that no deductions from the wages of any skilled or unskilled laborer shall be made for insurance. The re-employment office located at Las Vegas, Nevada, was designated as the local agency to prepare the employment lists for this contract.

Specifications, under special provisions, stipulated that the contractor perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than 80 per cent of the value of all work in the contract.

The contractors were bonded by the Fidelity and Deposit Company, of Maryland.



## "ENTIRELY SATISFACTORY IN EVERY RESPECT"

Here's what one user, in Texas, says about his Littleford Model "C" Pressure Distributor

"The Littleford Bros. Model 'C' asphalt distributor purchased in March of this year has proved entirely satisfactory in every respect and we are proud of the work we are doing with it.

"As you know, we have a very ambitious paving program and it was absolutely necessary that we purchase a full outfit of equipment to carry it through. We selected the Littleford Bros. Distributor in the 600 gallon

size mounted on a semi-trailer because it seemed to be the simplest and most efficient of any and could be used with our 1 1/2 ton trucks. We are happy to report that it is exactly what we need for our work and you are invited to refer prospective purchasers to us; or, better still, bring them out on the job and we will show them how it ought to be done."—Name sent on request.

Find out about the Littleford Model "C" Now!



**LITTLEFORD**  
Road Maintenance Equipment  
SINCE 1900

LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

by contractors. The unit in the accompanying photograph is owned by a California contractor and is shown on road work near San Francisco.

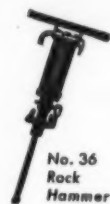
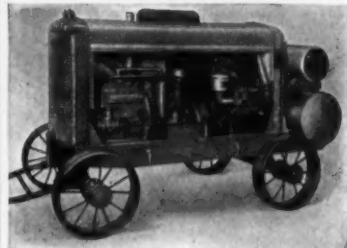
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• FULL CAPACITY

• UNINTERRUPTED SERVICE

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## WORTHINGTON PORTABLES are on the job



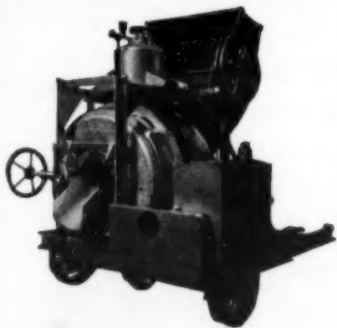
...and when the air tools are Worthingtons, the stick-to-it factor is 100%.

• Literature on request

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- Paving Mixers
- Building Mixers
- Masts and Towers
- Chuting Equipment
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Dunellen, New Jersey  
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## Change of Address Slip

Contractors and Engineers  
Monthly  
470 Fourth Ave., New York  
Please change my address on your records  
FROM

TO

### Automatic Hill Holders Now Available for Trucks

The automatic hill holder, pioneered and used exclusively on Studebaker passenger cars, is now available as an exclusive truck feature on six Studebaker bus and truck models, according to a recent announcement by the Studebaker Corp., South Bend, Ind. This hill holder device is available on the 1½-ton Ace, the 2-ton Boss and the bus

chassis models.

The hill holder is an automatic device, located in the hydraulic brake system which maintains the hydraulic pressure without continued foot pressure on the brake pedal as long as the clutch is kept depressed. When the truck is stopped facing up hill and both brake and clutch pedals are depressed, the hill holder comes into action and continues to function until the clutch is released. It is so devised

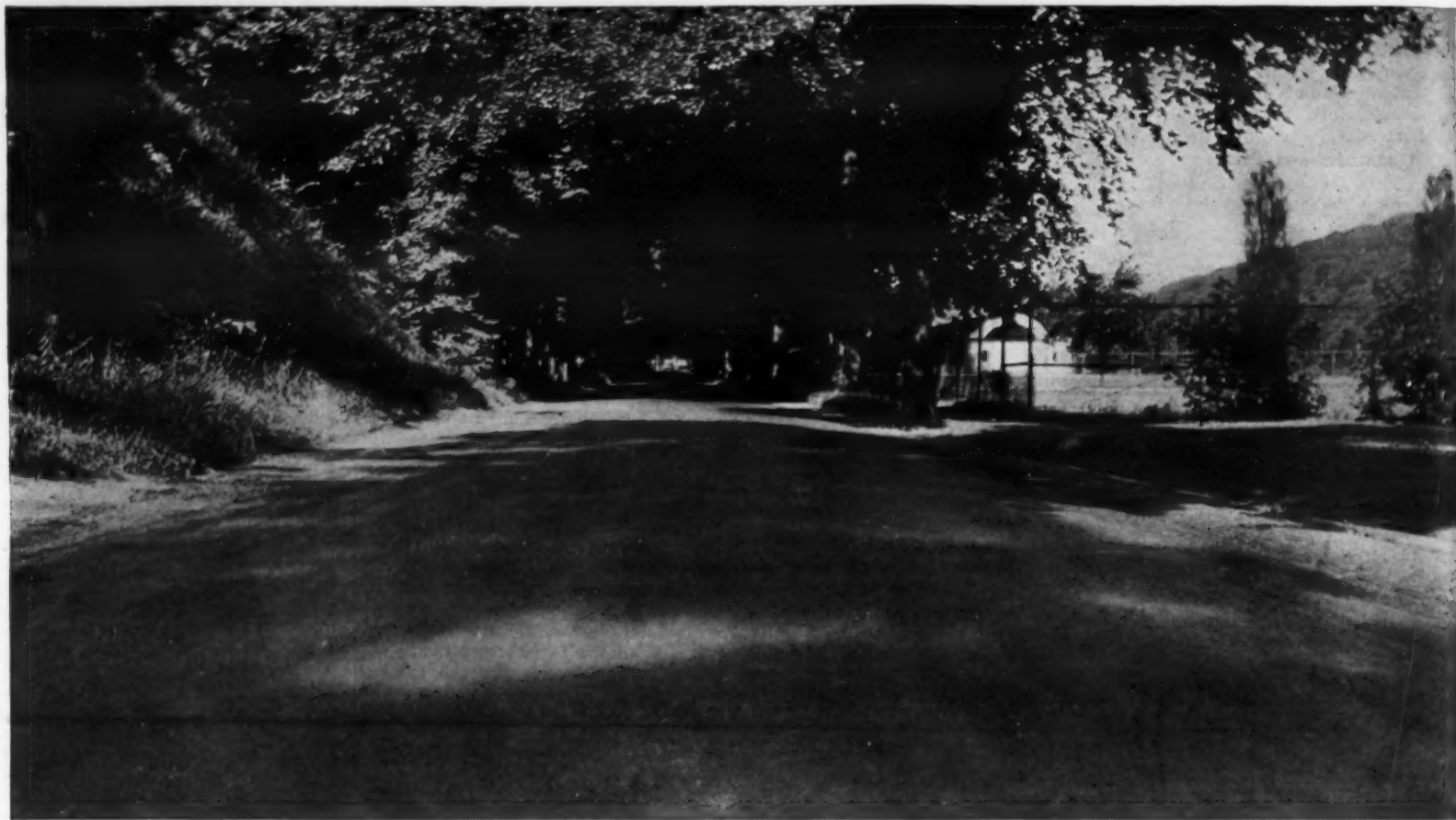
that it does not function when the truck is level or facing down grade.

### Borland Takes New Post At Westinghouse

J. E. Borland, after a year spent in activities associated with the electrification of South African gold mines, has returned to the Industrial Sales Department of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. where his work

will be concerned with the application of electrical equipment to power shovels, quarrying and mining operations.

During his stay in South Africa, Mr. Borland assisted in the installation of a 2,850-hp d-c hoist in one of the largest mines in the district. Borland has been with the Westinghouse Company for more than 17 years, engaged in engineering work associated with the electrification of mining and heavy material handling equipment.



## It will pay you to find out about STANOLIND CUT-BACK ASPHALT



● Ideal paving material for Park driveways and boulevards is Stanolind Cut-Back Asphalt. Easily handled at summer atmospheric temperatures; can be mixed on the surface with aggregates or in ordinary mechanical mixer. Purpose of Stanolind Cut-Back is to obtain an asphalt cement of correct consistency that can be readily applied without heating to high temperature. It is a mixture of paving asphalt and diluent. It assures penetration; uniform, effective bond; and is economical. When used to re-surface old bituminous pavement, Cut-Back temporarily softens the old surface to form effective bond. Ordinary maintenance equipment used for road mixing. For full details, write or call

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# ASPHALT

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IN LONG-WEARING ROAD MIXES . . . IN DISTRIBUTION OF LARSEN . . . IN TRIPYLER SATISFACTION



# Transplanting Cactus For Traffic Junction

(Photos on page 40)

THE artistic is creeping into the construction of our highways with the increasing attention given to roadside planting of various kinds.

Arizona is performing a distinctive service to the traveler with its plantings of cactus of many varieties in the triangles where various routes meet and where the automobilist is likely to hesitate to look over the array of direction signs and perhaps have a "coke" at the nearby thirst station for man and car.

## Florence Junction an Arboretum

There are now some ten of these plantings of which we shall describe in some detail the planting at Florence Junction, as it is typical and also has some distinctive features. Arizona, according to the Curator of the Boyce Thompson Southwestern Arboretum near Superior, Ariz., has 75 varieties of cactus and of these, 51 are represented in the planting at Florence Junction.

At each corner of the triangle, there is a wall of native lava rock, called malpai, cut and laid with mortar and alongside it some pieces of native malpai standing as they are found at all outcrops of the lava flow throughout the state. Within these walls are the various cactus plants, arranged in an attractive grouping.

## Rare Cactus a Feature

The story of the largest cactus that graces the Florence Junction planting is of interest. It is a Sahuaro with a crested top. The Sahuaro is not normally a fan or crest cactus and crested specimens similar to this are extremely rare, one being found for possibly every half million of normal specimens. The cause of cresting, according to the best of authorities, is not known. Some people have thought it was brought about as the cactus' means of covering an in-

## Arizona Is Landscaping Triangles Where Routes Meet With Native Flora, Good Direction Marking

jury. However, a growth of this type is known as a monstrosity and does not occur on giant cacti. The crest in all cases seems to be a perfectly normal, healthy growth, being more a freak than a malformation.

In the Arizona State Highway Department program there are several projects which will include the placing of crested cacti in junctions where they may be more readily seen by the traveling public. Due to their extreme scarcity, very few people have ever seen one, and consequently they form a point of considerable interest.

The rate of growth of a giant cactus in its early stages is comparatively slow. However, upon reaching a height of from 6 to 8 feet, this growth speeds up, reaching as much as 6 inches a year. According to Fred Gibson, Curator at the Boyce Thompson Southwestern Arboretum, the cactus located at Florence Junction is somewhere in the neighborhood of 250 years old. The normal life of a giant cactus is somewhere between 400 and 500 years.

This cactus was transplanted from its native site approximately 30 miles from the job. The greatest care must be exercised when moving these specimens to prevent bruising as they are very susceptible to injuries and rot easily when marred. Specimens are usually wrapped in a layer of mattresses over which are lashed heavy planks to prevent twisting or breaking.

The giant cactus, when transplanted, requires very little water. In fact, many people, through ignorance, have lost fine and valuable specimens through the application of excessive water. Once the cactus is properly set in the ground, it

should obtain its water in the manner provided by nature. Usually in moving these specimens, most of the roots are cut off, allowing the stubs to heal thoroughly in the sun before re-setting.

## Lighting and Direction Signs

Above the wall in each corner of the triangle is a bracket of lights playing on the route number signs, all the arrows of which have reflector buttons in case of failure of the lighting system. The lighting standards were furnished by the state and the current is furnished without cost to the state by the adjacent service station which has a Kohler plant for the illumination of the station, the house and for the operation of its various services.

Particular attention should be called to the method of marking highways at intersections in Arizona. At each intersection the traveler will find the usual direction signs with the names of the cities to be reached by the roads shown by the route numbers, the distances and arrows so that it is possible to recheck

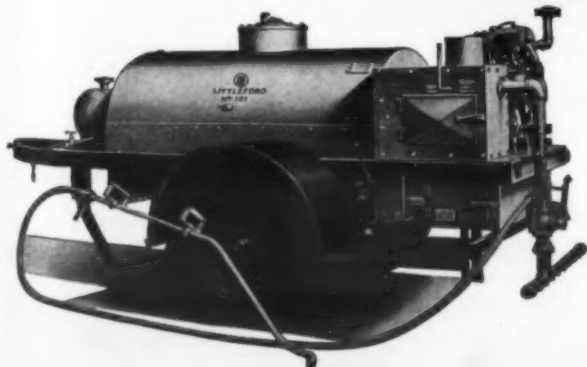


C. & E. M. Photo  
Well-Planned Direction Signs and Cactus Display at Florence Junction, Arizona

the direction. Then several hundred feet along the highway one finds another sign with two or three names on it and distances as another check on the observation of the driver. This is most important in such states as Arizona where the distances are great and there is no way of correcting a mistaken direction except by driving back to the intersection again. Cross roads are not existent, or if there are, they are not graded for automobile traffic.

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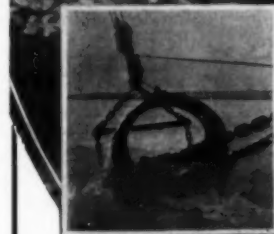


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## Make Plans Now for Snow Drift Control

(Continued from page 13)

feet from traveled way.

2. The size and shape of the eddy area produced by a fence will control the size and shape of the completed snow drift. The fundamental shape of the eddy and snow drift is in the form of an ichthyoid curve.

3. A snow fence with a ratio of 1 to 1 for the width of slats and the opening between the slats gave the best results. A barrier with 50 per cent open spaces should be the most efficient.

4. Raising the bottom of the fence more than 12 inches above the ground reduced the effectiveness of the fence at high wind velocities. A height of 6 inches above the ground gave the best results for all conditions.

5. Any inclination of the fence from the vertical reduced the length of the eddy and the drift. However, an inclination of not more than 30 degrees with the wind tends to keep the bottom of the fence clear.

6. The position of the maximum depth varies with the type of barrier, wind velocity and density of snow. This distance may be any length from zero at the barrier to two-thirds the length of the drift. The end of the drift will remain constant.

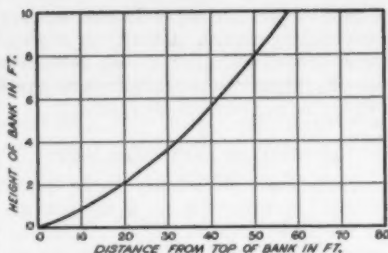
### Natural Snow Fences

The natural barrier, or snow fence, consists of trees or shrubs planted in rows or groups in such a way as to slow down the normal velocity of the wind and produce a drift. This type of snow control is best adapted to wide right-of-ways and localities where permanent snow fences may be left in place the year around and fits in very nicely with the modern trend towards highway beautification.

In present practice the trees, when planted, vary in height from a few inches to several feet. Local conditions, available stock and cost are, no doubt, the deciding factors when it comes to planting. As it takes from four to six years to grow a tree of effective height, many advantages are gained by planting the higher tree. The high trees give immediate protection and beautification with a low maintenance cost, but a high first cost. The smaller trees have a low initial cost, but require years of maintenance against grass, weeds, fire, theft and cutting off by machines, factors which should offset the higher cost of the more effective trees.

The present tree planting arrangements may come under any one of these three groups, the single-row barrier, the double-row barrier and the multiple-row barrier.

1. The single-row barrier, to be effective, must be planted very close. The trees are allowed to take their natural growth or are topped each year to form



Relation Between Height of a Ridge and Distance to the End of Drift

a dense hedge. This type of planting is suitable for narrow right-of-ways and spots where more open and wider barriers can not be used. The spacing of the trees depends upon the maturity height of barrier, the shape of the tree to be planted and the kind of tree.

2. The two-row barrier is used quite extensively. The trees are planted either close together in each row to form a tight barrier, or loosely and staggered to form a more open barrier. The trees are planted from 3 to 4 feet apart and thinned as they grow up, or they are spaced several feet apart and allowed to take their natural growth.

3. The multiple-row barrier may consist of three or more rows of trees. The usual number is five rows, from 5 to 15 feet apart, with the trees usually spaced from 8 to 10 feet apart in the rows.

In the case where deciduous trees are used instead of evergreens, the tall trees are placed on the lee side of the barrier and low growing shrubs are planted on the windward side to prevent the wind from sweeping under the trees.

In general, it may be said that the planting arrangement will depend upon:

1. The width of the right-of-way, the length of the barrier and the topography and development of the lands adjacent to the highway.

2. The specie of trees to be used and their growth, spread, hardiness and tolerance.

3. Ample spacing for moisture and feeding area for the roots.

4. The age to which the belt will be allowed to grow.

5. The facilities for cultivation and maintenance between the rows and the type of machinery to be used.

6. They should be planted close enough to get the benefits sought and keep down the weeds and grass.

The trees best adapted for use in the natural snow barrier are the evergreens, including the pines, spruces, firs, and cedars. Low spreading shrubs, such as buffalo berry, buck thorn, willows, barberry and others are used in various combinations with box elders, the green ash, the white elm, the Caragana, the North West poplar, and other trees that have a suitable branch development.

The effective area of a tree barrier will average about 16 feet from the edge of the trees to each foot of tree height. This distance has been checked by measurements in the field and by wind tunnel tests. A barrier consisting of only one row of trees will have a less effective

area per foot of height due to the openings between the tree tops, which are not sealed as in the case of the double row.

To break the effect of uniformity in plantings, the rows may be irregular in number with the greater depth at points where the drifting is most serious.

Our prairie states have found it necessary to plant deciduous trees and shrubs in localities where the evergreens will not stand the severe conditions. The barrier usually consists of several rows with the taller trees on the inside rows and the low growing shrubs planted in the windward rows to prevent the wind from blowing under the trees.

### Shrub Planting for Snow Control

Very little use, if any, has been made of our flowering shrubs as a source of material for snow barriers, although they certainly would work into a highway beautification plan more readily than a long, monotonous row of evergreens.

A shrub suitable for use in a snow barrier should be very hardy, should have strong, flexible branches to withstand high winds and snow and ice deposits, tolerant to sun or shade and grow under adverse soil and climatic conditions.

There are a large number of shrubs, both of the native and domestic varieties, that will come under these specifications. They are either tree-like in shape like the magnolia, hawthorn and sumac, or upright like the mock orange, Caragana, Japanese quince, or of the drooping type like the red dogwood, barberry and spirea.

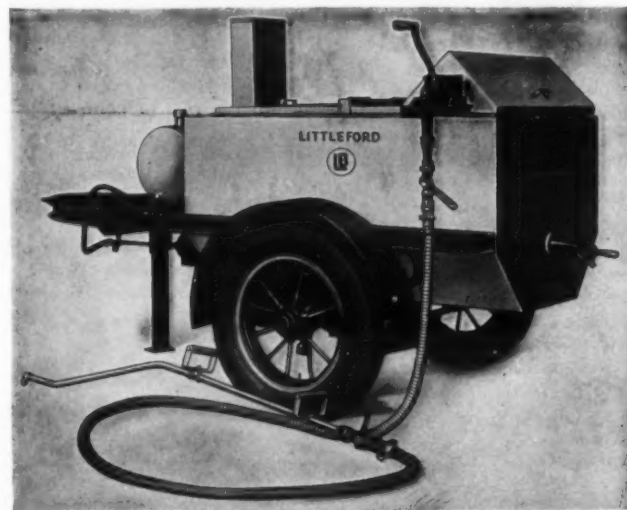
All planting should be harmonious and adapted to the locality and should usually be native stock. First, native plants harmonize with the plant character of the surrounding country. Second, they are hardier under roadside conditions than are imported or developed plants, and third, they require less maintenance. In some cases, it is desirable to use non-native stock as an addition to the native species.

The shrubs should be selected for their winter appearance as well as summer appearance. It is possible, with the varieties available, to have continuous bloom from early spring to late fall, and throughout the winter there are the berries and colored barks that will blend in with the winter landscape.

The planting arrangement at each drift spot will require careful consideration. It will be necessary to consider the length of planting, thickness of the planting, height of shrubs, distance from the roadway, a solid or open planting, arrangement of the shrubs for effectiveness and local conditions.

During the last few years roadside improvement has been given a great deal of consideration. There is no reason why a planting along the roadway cannot serve a two-fold purpose of snow fence and beautification.

There is a drive on in India to save the roads from metal-tired bullock cart wheels. Some districts are cutting the license fee on such conveyances as much as 85 per cent if rubber tires are used. In other sections, carts using rubber tires are entirely exempt of taxation.



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# Municipal Work on State Roads

## Simplified Methods for Reporting Municipal Expenditures for Trunk-Line Maintenance Devised by Michigan State Hwy. Dept.

By MURRAY D. VAN WAGONER,  
Michigan State Highway Commissioner

WITHIN the last year the Michigan State Highway Department has adopted a new method of reporting municipal expenditures for trunk-line maintenance. As previously, a separate report is required quarterly for each maintenance section handled by the municipality. The number of these sections in each municipality varies from one to fifteen, with an average of three.

The purpose of the new report form is to simplify and condense the information required by the Department and to relieve the municipalities from reporting unnecessary detail. In the past it was necessary that the detailed information be checked by the Department's field auditors when checking over the reported trunk-line maintenance expenditures. It is still necessary for the municipality to keep this same detailed information available to the field auditors, but the new report merely provides the Department with a summary of these data. However, the new form contains sufficient information so that the Department may authorize payment to the municipalities and so that it has available the necessary information for comparison of accumulated costs with the annual budget and for analyzing and studying maintenance costs.

The reports formerly used required three forms for each maintenance section, instead of the one now in use. The first form covered the State trunk-line maintenance pay roll and provided space for the name of the employee, the class of work, the dates employed, total hours or days, rate, total amount, voucher number, and date of payment. The second form covered expenditures for materials on State trunk-line maintenance and provided space for the class of work, from whom purchased, item, unit price, amount, voucher number, and date of payment. The third form covered the equipment report for State trunk-line maintenance and provided space for the name and number of the equipment, the dates used, the total days or hours, daily rate, and amount. In addition, on the back of each of the above reports, space was provided for

distributing the individual expenditures among the different operations.

### Description of New Form

The three old forms have now been replaced by one. In the new form, the left hand column, headed "Operation," lists the various classifications of maintenance work. These classifications have been sufficiently subdivided so that the maintenance costs can be readily analyzed.

The next four columns of this form, under the general heading, "Expenditures for Quarter," are for reporting the amount expended on each of the various operations listed, for Pay Roll, Materials, Equipment, and Total.

The last three columns on the right of the form, under the general heading, "Totals to Date," give the current status of the budget for each operation listed. The column headed "Budget" is for showing the original budget for each of the different operations, or the adjusted budget, in cases where adjustments have been made. Under "Expended," the amount will be the same as the total under "Expenditures for Quarter" in the first quarter's report, but in the reports for the following quarters will be the cumulative total of the amounts expended during the current and preceding quarters. The column headed "Balance" is for listing the difference between the "Budget" column and the "Expended" column, or the amount of the budget still unexpended.

Space is provided in the lower left hand corner of the form for computing Percentage Overhead, Compensation Insurance, and Garage Rental. The arrangement of this space and the items included are determined by the requirements of the contract between this department and the municipalities, and would, of course, be subject to change to conform with variations occurring in other forms of contract.

### Advantages of Change

In using the new form, instructions to the municipalities point out that they must continue to keep accurate and permanent time records of employees and equipment used on trunk lines, and that all materials charged on the report must be easily traced to the job and the vendor, in order that the field auditors may have complete records on which to base the audit.

A certification sheet, providing for certification by the Clerk of the municipality and approved by the Municipal Maintenance Superintendent and Resident Maintenance Engineer, is required to be submitted with the report of each municipality covering all of the maintenance sections in that municipality, thus obviating the necessity for certification of the individual sheets for each maintenance section.

The Department has found that the

Reproduction of Form Used for Reporting Municipal Expenditures on State Highways

new procedure has been justified by the results obtained, in that it receives all the necessary information in a form more readily usable, the work of the field auditors has not been unduly increased, and the burden of reporting by the municipalities has been considerably decreased.

## New Air-Drying Enamels Protect Iron and Steel

A new line of air-drying enamels, especially designed to prevent the corrosion of iron and steel in railroad and highway bridges has been developed by Maas & Waldstein Co., of Newark, N.J. These new anti-corrosive enamels are made of rust inhibiting pigments and a synthetic resin vehicle, and form a hard, tough coating that is resistant to wear and of pleasing appearance. Exposure tests, conducted for a long period of time, show that these enamels are effective in providing protection from the corrosive action of humidity, salt water, alkali, and a variety of chemicals, and in preventing electrolytic action, according to the statement of the manufacturer.

A single coat gives adequate protection where the exposure is not prolonged or severe, but for maximum protection the manufacturer recommends two coats. The enamels may be applied either by brush or by spray. They air-dry in four hours and are hard overnight. The available colors are brown, black, red, and a bronze liquid, which serves as a vehicle for aluminum and other metallic powders.

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## N. J. Designs New Expansion Joint

(Continued from page 10)

it adequate for the purpose would result in the use of so much metal and trouble as to make the method described preferable. This method is now in its third year of use and no complaint as to its complexity has been received, although before the joint structure was used a look at the blueprints convinced most contractors, and many engineers, of its impracticability.

Careful inspection of all parts is essential to successful installation but since all parts are made with machinery and mass production methods, the percentage of rejections has been small. Perhaps the greatest manufacturing difficulty has been in obtaining straightness of the dowel. Formerly, dowels were sheared to length and became bent in the process. Now they are sawed and are generally straight.

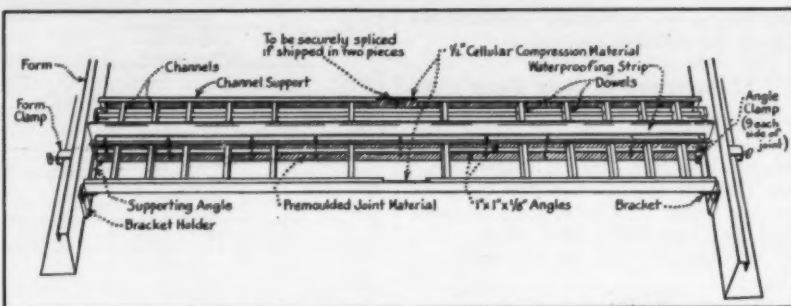
### Dowels Prepared for Expansion

All dowels are painted their full length with two coats of lead paint (white lead being preferable) so that they will slide readily. Formerly a cut-back asphalt was specified and on some jobs this was doctored with kerosene and gasoline to such an extent that the thickness of the coating was about that of ink. The dowels did not slide and cracked slabs resulted in a few cases. During the progress of the work dowels were pulled loose on some exposed ends and it required in excess of 30,000 pounds to loosen some of them. Twelve dowels at this rate would have a resistance of 360,000 pounds, which would give stresses of 450 pounds per square inch in tension in new concrete. More care was then used in coating dowels. During the following winter several substances were tested and white lead, red lead and transmission oil were specified. It is hoped that further experimentation along this line will produce a single coating which will loosen the dowel at pulls under 1,000 pounds.

At the end of dowels, fitting inside each cross channel support, is a  $\frac{1}{2}$ -inch strip of cellular compression material to absorb the expansion. At first, corrugated paper was used, but it became wet on the work and was too flimsy to handle. Later, premoulded bituminous joint material was used but this produced a hydrostatic pressure under expansion. No failures have yet developed on this account, but it was thought to be critical at times of great expansion. This cellular compression material runs nearly the full width of the pavement.

### No Plane of Weakness

A very persistent criticism has been that this arrangement decreases the uniform section and creates a plane of weakness. Without having given much thought to the subject, many assume that a pavement slab is a perfectly balanced structure, that the loads in all parts of the slab are transmitted to the subgrade uniformly, that each part of the slab is subjected to the same stress. The portion of the slab near the joint acts somewhat like a cantilever or overhanging beam when the load is on the end. In a cantilever the maximum bending moment for a load at any point is at the support, the moment at the end being zero. Hundreds of failures have shown that when this produces a critical stress, the support is about 6 to 8 feet from the joint for 9-inch pavements. A point 10 inches from the joint would have about one-eighth of this stress and have about 75 per cent of normal section and about 95 per cent of bending resistance to absorb it. From the standpoint of shear, no discussion seems needed. From the standpoint of contraction the critical stress is theoretically in the center of the slab and



Assembly of New Jersey Beam-Type Joint Before Pouring

there is no stress at the end of the slab except that offered by the resistance of the dowels to sliding. At a point 10 inches from the joint it is seen that the stress is insignificant as long as the dowels slide freely.

In 1934, late in the fall and early winter, several cracks appeared at this point due to failure of the dowels to slide. Cracks appeared at other points for the same reason. In the 1935 work, the dowels were properly painted and not a single crack which can be attributed to the joint structure has appeared to date. Even in the 1934 work, where considerable expansion occurred before contraction, the bond was broken and no crack developed, although pulls of 10,000 pounds were found to be necessary to break the bond at points where tests could be made.

### Other Criticisms Answered

Another criticism of the joint is that it is unnecessarily heavy and expensive. When separate bids were taken on two jobs, the cost, including installation, was 88 cents per foot. Until it has been determined how much steel should be in a joint it seems that any error should be on the side of safety. Each dowel is several times as stiff in bending as the round  $\frac{3}{4}$ -inch dowel, which tests indicate is deficient for long life and heavy truck traffic. There has been some question as to whether or not these stiff dowels or beams would stiffen the slab ends so as to decrease the unit pressures on the subgrade under the slab ends by distribution over an area greater than would be the case with a single load transfer hinge-like device. Preliminary tests indicate that newly constructed joints do stiffen the slab ends in proportion to the amount of section moduli of the beams. This is not a great deal and possibly decreases with wear. Although such stiffening increases the warping stresses, this is very slight and at a location where they are very small.

### Metal Waterproofing Strip

Attached to the joint structure is a metal flashing or waterproof strip to

prevent entrance of water to the subgrade through the joint space. Experimental installations, made in 1932, recently indicate the possibility of some trouble with spalling because of stones, dirt and sand working down between the metal and faces of concrete. It seems probable that this is a fault of all flexible joint coverings made of metal. Considerable study and experimentation is now going on with the purpose of substitution of a different type of device.

### The Joint Is Successful

The testing of many types of joints, careful observation of their behavior under test and in failure, a study of the causes of failure, a study of what is practicable to expect in results from untrained forces and high pressure methods form the basis for the design of this joint structure. Improvements and refinements are added as continuing study, trial and experience makes them available. With the present knowledge of pavement design no mathematical analysis seems to be available from which greater refinements can be made. The structure has successfully withstood all forces which act on it so far as is known to date. No suggestion of possible structural failure within a long pavement life has come to hand.

This phase of pavement design is receiving greater recognition as being one answer to longer pavement life. Engineers have resisted increased cost of adequate joint structures until they are convinced that it is inevitable.

### Portable Pipe Lines for Construction Jobs

Calco Spiral-Welded pipe, in 20-foot sections, is made by the California Corrugated Culvert Co., Berkeley, Calif., for conveying compressed air, water, etc., in all sorts of locations where movability is a prime requisite, making it particularly adaptable to construction jobs for compressed air lines, water for concrete mixing and curing, and for temporary water lines.

This spiral welded steel pipe comes in 3 to 6-inch diameters and in the 4-inch size weighs about 75 pounds per length. On one job in California, 4-inch Spi-Weld pipe was used as a container or reservoir for the compressed air and with suitable compressor capacity behind it easily handled 16 jack hammers at one time. While it costs about twice as much as the usual 2-inch pipe used for air lines, it has about eight times the capacity.

One of the features of this pipe is the Rapid Action coupling, all parts of which are welded to the pipe sections. The flexible gaskets remain securely in place during line removal and the coupling ends are reinforced for strength and durability. The joints are readily flexible, providing for line curves and for use on uneven ground. With this coupling a water-tight and air-tight joint is accomplished in a few seconds, without the use of special tools. Disjointing is equally quick and easy.

Complete information on this Calco pipe may be secured direct from the California Corrugated Culvert Co., by mentioning this magazine.

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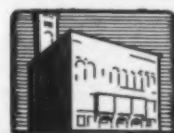
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# Experiments in Use of Jute for Roads

City Engineer of Dundee, Scotland, Tries Various Methods of Construction Using Jute Cloth

A CONSIDERABLE number of experiments have been going on recently employing cotton fabrics and jute in road construction. In this country extended experiments are now being carried on, testing cotton fabric for reinforcing bituminous roads.

From Dundee, Scotland, where the jute trade predominates, comes word through the U. S. Bureau of Foreign and Domestic Commerce, of some interesting experiments with jute cloth by Dundee's City Engineer.

The use of jute cloth in road construction varies, of course, with the type of road under construction. In tar-macadam roads, it is claimed that in hot weather the chippings forming the top surface of the road are prevented from sinking into the tar compound by the jute fabric and conversely, that the compound is prevented from rising to the surface. Consequently bleeding does not take place and the subsequent results are obviated. It is further claimed that the fabric keeps the edges of the road from breaking up or being washed away and that successive layers lessen the noise of traffic. In cases of repair, it is also possible to remove the surface in slabs.

This latter advantage is of particular importance in concrete roads, particularly where they are subject to heavy traffic, as at bridge approaches and bus stations. As it is, of course, important that there should be a good key between the material above and below the fabric, the fabric suitable for concrete road construction is considerably lighter than that used in bituminous roads.

## Dundee's Experiments

The City Engineer of Dundee chose a stretch of some 200 yards of road for his experiments. The existing water-bound macadam was removed and a base course of tar macadam 3 inches consolidated depth was laid down. This was composed of 2-inch graded whinstone, or basaltic rock as it is known here, and Bituphalt, 8 gallons to a ton. The surface coat was composed of 1-inch sand asphalt with pre-coated chips, 3/4-inch grade, rolled in.

On the first experiment, in order to bring back the Bituphalt of the base course to give adhesion for the jute cloth, the surface was sprayed with a fine spray of creosote oil, about 1/2-gallon to 400 yards. On the top of this a layer of jute cloth, 5 1/2-ounce Hessian giving 8 lines to the inch both ways, was laid and then rolled. Half of this area was again sprayed with creosote oil at the same rate as the first application. A coat of asphalt 1-inch deep was then laid as on the previous section of road. It was discovered that the sand carpet was not penetrating the jute cloth so the cloth on the remaining half of the section was rolled back and the interstices in the base course filled with a scrape coat of sand asphalt. The jute cloth was then placed in its original position, rolled again and the asphalt coat laid as formerly.

The second experiment was carried out on the lines of German specifications for this type of construction. As the base course had been laid to take a 1-inch coat of asphalt, it was necessary to obtain this depth with the experimental surfacing. To effect this, the gage of the first layer of chips was increased to 1/2-inch. The interstices of the existing coat were filled with a layer of 1/2-inch chips and rolled. The road

was then tar-sprayed at the rate of 3 yards to the gallon and the jute fabric was rolled into the hot spray, leaving an overlap of 2 inches at the joints. The fabric was then tar sprayed at the rate of 4 yards to a gallon, chipped with 3/8-inch chips and rolled. After a lapse of 24 hours, the surface was swept clear of excess grit, tar sprayed at the rate of 5 yards to a gallon, and gritted with 3/4-inch chips. The fabric used in this experiment was 8-ounce Hessian with 12 lines to the inch.

The third experiment was carried out according to Calcutta specifications, where the work was done as follows: The existing road surface was thoroughly scraped and all dust removed. A coat of Colfix was painted on the surface, using one gallon to 3 square yards. The cloth was then laid on the road longitudinally, starting from the edge of the road, allowing 2 inches of the outer length of the cloth to be buried or grouted in with the bitumen and chips and overlapping the other lengths by 2 inches until the center of the road was reached, in such a way that the center of highest piece of cloth on the road camber overlapped on top of the next piece and so on to the edge of the road. The surface of the cloth was then rolled to make it adhere to the road surface. The surface was again painted with Colfix, using one gallon to 3 square yards when Colfix would penetrate the cloth and form a solid mass with Colfix underneath. One-quarter-inch chips were then spread on the surface which was again thoroughly rolled and opened to traffic. It was found in Calcutta that road surfacing by this method was cheaper than if ordinary double surface painting were carried on with 1/2 and 1/4-inch stone chips. The cloth used was 40-inch 8-ounce.

With these specifications as a guide, the surface of the Dundee road was spread with a layer of 1/2-inch chips rolled in. The surface was then sprayed with Bituphalt at the rate of 3 yards to the gallon and chipped with 1/2-inch chips. These were then rolled and sprayed with Spraymulsion at the same rate. Then the jute fabric was laid down, sprayed with Spraymulsion at the same rate and chipped with 1/4-inch chips. Forty-eight hours later it was found that the covering over the jute could be scraped off quite easily so it was decided to cancel this experiment. The surface was therefore covered with a coat of Armourite squeegeed on and

chipped with 1/2-inch chips.

For the sake of comparison, a stretch of road contiguous to the experimental section was laid without jute cloth as follows. The interstices of the base course were filled in with 1/2-inch chips rolled in and tar sprayed with Bituphalt. This was covered with 3/4-inch chips and rolled. Half of the area then received a squeegee coat of Armourite and was chipped with 1/2-inch chips. The other half was sprayed with Bituphalt and chipped with 1/2-inch chips. The repeated coats were necessary in order to obtain the requisite inch depth of wearing coat.

## Observations

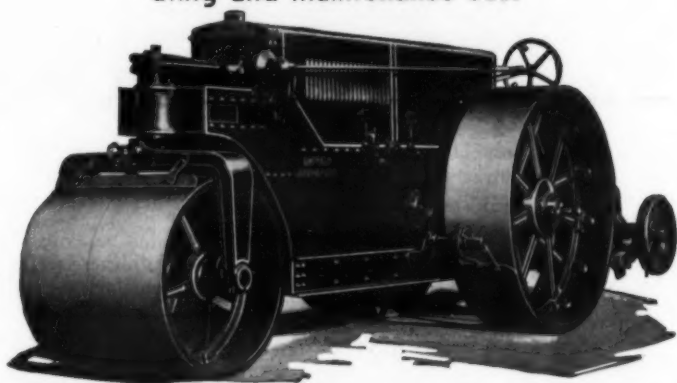
The City Engineer's Office, in commenting on the experiments, observed that in the first experiment there was no penetration by the sand asphalt of the jute cloth. This produced a tendency for the asphalt coat to slip when rolled and the rolling had to be continued longer than was usual for such a coat.

This in turn caused minute cracks to appear in the sand asphalt carpet which may have a deleterious effect as time passes. The third experiment, as already noted, was a failure and the remainder of the experiments, which seem satisfactory now, can be judged only by time, when the effects of changing seasons, the continuous traffic and other factors will become apparent.

## Costs

In the first experiment, the cost of the jute was 3 1/2 cents per square yard, the cost of laying and creosoting was 0.8 cents a square yard and the extra cost for the scrape coat was 5.1 cents a square yard. For experiment No. 2, the jute cost 4.6 cents, laying, rolling, etc., cost 0.6 cents and the spraying and chipping cost 29.5 cents, per square yard. The total cost of the third experiment was 42 cents a square yard and the two sections of the fourth experiment cost 30 cents and 17 cents a square yard, respectively.

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Above (in circle) are two Novo 2-in. Self-Priming Centrifugal Pumps dewatering the trench for Detroit's natural gas line going through a swamp in Wayne County, Michigan. This is the United Engineer end of the job.

At the left is a Novo Double Open Top Diaphragm Pump as used by the Bibb Construction Company on their end of the job.

**NOVO ENGINE CO. LANSING MICHIGAN**





Result of the Explosion Which Broke the Rock Into Blocks Most of Which Could Be Handled by the Bulldozers

## Blast Moves Rock Away from Channel

Knob at Cascade Locks, Columbia River, Broken Down and Bulldozed To Provide Free Passage for Flood Waters Above Bonneville

THE General Construction Co. and J. F. Shea Co., Inc., contractor on the power house substructure and navigation locks at Bonneville, also have some other contracts in connection with the project. One of these, though not great in size, involved an interesting piece of blasting work. It consists of leveling some 10 acres of Lock Island, about 6 miles up the river at Cascade Locks. This area will be submerged, and, being at a narrow portion of the river, the rocks and obstructions would impede free passage of the water through the pool, especially during high water periods.

The area was to be brought down to Elev. 75 feet and the contractor moved in there with two Caterpillar diesel tractors and bulldozers, a Seventy and a Seventy-five, a Gardner-Denver 360-cubic foot gas-driven air compressor and four Gardner-Denver drills. They could not bring in a shovel by barge on account of high water, and there was no bridge to get it across the locks. The above equipment was a little slower, perhaps, but none the less effective.

One large obstruction faced them. This was a hill of solid rock, on the north side of the island next to the channel. This contained approximately 6,000 yards, the rock being soft andesite—dead and punkey. Furthermore, the U. S. engineers did not wish to have any of the rock thrown into the river channel, where it would continue to be an obstruction. Therefore, the problem of the blast was to lift the rock up, break it and drop it back, propelling as much as possible toward the island side, where it could be pushed away onto the area by the bulldozers without further shooting.

### Preparations for the Blast

P. O. Nicholson, superintendent for the contractor, planned the blast. First, they dug a coyote hole straight into the hill 41½ feet long and 3 feet by 3 feet in cross section. This was near the elevation to which the area was to be leveled. From this hole, five horizontal laterals were dug at varying intervals and from 6½ to 16½ feet long. They were so dug that none of the five charges when placed in the ends would be nearer than 15 feet from the surface and on the channel side no nearer than 30 feet.

The charges ranged from 200 to 750 pounds, and totaled 2,400 pounds. The explosive used was Atlas Flo-Dyn No. 4 quarry. This is a slow acting explosive and was packed in the ends of the laterals in 12½-pound bags, with one stick and detonator in each charge.

The whole was fired simultaneously by means of a battery and electric exploders, California Cap Co. No. 6.

After the charges were laid, the laterals and then the main tunnel were filled with loose dirt, tamped in well by hand.

### The Result

Everything was ready at 9:45 a.m. on July 15. While everything had been planned as carefully as possible, the results of a blast of this size are hard to foretell with certainty. So there was some little tension on the part of all when the plunger was pushed down. There was a muffled explosion, the hill rose slightly and subsided. On the side toward the island, masses of rock were thrown out some 200 feet, but scarcely a rock fell in the channel. On that side, a high cliff was left standing, though cracked through in every direction.

Much of the rock was in sizes that could be readily handled by the bulldozers. The rest could be vertically drilled and shot easily with small charges, including the standing part, which could be worked down on the island side with small shots. On the whole, it was a practically perfect shot for the purpose. Not very spectacular it is true, for this was not one of those high, wide and handsome shots and was not intended to be. But the explosion broke out on the island side, throwing rock well to the left, and inside of a few minutes the bulldozers were on top of it like ants on a disturbed ant hill.

## New Tri-Borough Bridge Has "Battledock" Floor

New York City's recently-opened Tri-Borough Bridge, spanning the Harlem River between Randall's Island and Manhattan and also crossing Ward's Island and Hell Gate to Queens, has battledock type floors, for the lift span units, composed entirely of 5/8-inch structural silicon steel plates with a 1-inch wearing surface of asphalt plank. The plates are welded together by 5/8-inch butt welds and by 3/4-inch fillet welds to each flange of the longitudinal floor beams.

Approximately 3,000 feet of butt welds and 1,500 feet of fillet welds were required for laying the 350 feet of flooring for the Bronx lift unit, the Manhattan unit requiring somewhat less. The welding was done largely with Lincoln gasoline-driven Shield Arc welders and Shield Arc Eighty-Five electrodes, made especially for high tensile steel.

Specifications and procedures for the welding were worked out by the consulting engineers, Ash, Howard, Needles and Tammen, in conjunction with the welding engineers of the Lincoln Electric Co. All the arc welding operators were required to pass a qualifying test by producing welds having a tensile strength of 76,000 pounds per square inch and ductility of 20 per cent elongation in 2 inches in outside fibers. These requirements were exceeded. Actual figures showed tensile strength of approximately 90,000 pounds per square inch and 35 per cent elongation in 2 inches.

## Road Maintenance Centralized in N. M.

(Continued from page 15)

work independent of the maintenance patrols.

At the present time this plan of equipping the maintenance patrols and districts is in use on about 75 per cent of the mileage under maintenance, and the results which are being accomplished are entirely satisfactory.

### Graph Shows Monthly Costs

Maintenance costs per mile for the twelve months period ending December 31, 1935, show the following averages for the different types:

Cement concrete pavement.....	\$100.99
Bituminous types.....	328.43
Crushed gravel and stone.....	203.65
Earth graded.....	153.50

The budget system is used to control the expenditures of each maintenance patrol. As a ready reference, and to facilitate the checking of expenditures, the total budget allowance for each patrol is shown graphically, and the monthly expenditures plotted on the graph. In this way, unusual expenditures are easily detected by a sharp break in the monthly expenditure curve, and the cause can be determined by examining the cost records for the patrol.

Notwithstanding the fact that New Mexico has a large area and a scattered population requiring a large road mileage to serve, and a comparatively modest income for maintenance work, it has been possible by careful management and rigid control of expenditures to live within the budget allowance and still meet the demands of the traveling public in a manner reflecting creditably on the Highway Department.

## A New Power Control for Shovels Reduces Fatigue

In keeping with the trend to reduce fatigue in methods of doing work, Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., has announced a new power control for the operation of shovels, draglines and cranes. This Speed-o-Matic control is claimed to eliminate operator fatigue, speed up operations and increase output.

With this new control, a small fraction of the power of the machine is harnessed for doing the work of operating the levers under the guidance of the operator, instead of requiring his manual labor in performing the necessary operations thousands of times a day. The Speed-o-Matic control has no wearing parts between the clutches or brakes, and the conveniently arranged control stand is placed in front of the operator's seat, at the front of the cab. Even the foot pedals are operated from a seated position.

Speed-o-Matic control is now furnished as standard equipment on the Link-Belt shovel-crane-dragline models K-40, K-45, K-48 and K-480.

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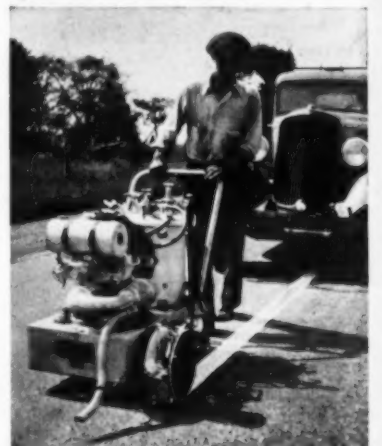
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The Littleford Traf-O-Spray sprays the paint, onto the highway surface under pressure. Patented rolling guide discs on each side of the spray prevent edge bleeding. Your lines will be penetrating, even, sharp, and will not require hand retouching when using the Traf-O-Spray. Use any highway paint, lacquer or emulsion on any hard surfaced road. Ask for Bulletin L-9.



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Accurate control of materials to comply with any standard specifications for bituminous mixtures.

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HETHERINGTON AND BERNER INC

Indianapolis, Indiana



## Picks and Shovels

(Continued from page 1)

for ease of draught and the preservation of the roads."

McAdam was convinced that good roads presented the most vital need of the day but, like many of the great minds of the world, his views were so far in advance of his times that they were scorned by the majority. Nevertheless he persisted to preach his ideas of road building, both by speeches and writings and at his own expense, in spite of great opposition, carried on experiments in road reconstruction and repair.

He considered himself a road repairer, not a road builder but the condition of the roads of that day was due to the fact that they wholly lacked construction and McAdam's theory brought for the first time a scientific and constructive attitude to bear on the road problem. His principle concerned the foundation, not the surface, of the road, and the originality of his scheme lay in the use of angular broken stones and the covering of the road surface with an impermeable crust which prevented the water from soaking through to the foundations. He was very much opposed to the use of any sort of binding material. The following excerpt from his book published in 1827 sums up fairly completely the methods of construction which he advocated.

"Every road is to be made of broken stone, without mixture of earth, clay, chalk, or any other material that will imbibe water, and be affected by frost; nothing has to be laid on the clean stone on pretence of binding; broken stone will combine by its angles into a smooth surface that can not be affected by vicissitudes of weather, or displaced by the action of wheels which will pass over it without jolt, and, consequently, without injury."

Yet the binder was there in the form of hardened mud worn from the stones.

In 1815 his theories had gained sufficient recognition to secure for him an appointment as Surveyor of Bristol and in 1827 he was appointed by the Government General Surveyor of Roads, proof of a final though tardy, recognition of his work. He died at Moffat, Dumfriesshire, in November, 1836.

Though the full development of the coaching system owed almost everything to McAdam's work, it was not until the advent of the motor car that the defects of the construction he disapproved so heartily were clearly realized. Since that time, the roads of the world have been built upon a foundation of John Loudon's McAdam's foresight and sound practical common sense.

It therefore behooves the road builders of today to pause briefly in this

year of the 100th anniversary of his death and give thought to the man and his ideal of good roads, to which he devoted so much of his fortune, his energy and his life.

## The Increasing Trend Of Night Accidents

The record of four states where an accurate count of day and night traffic accidents has been made for several years show that nocturnal smashups and fatalities have increased steadily for almost a decade, while the number of daylight accidents has decreased. Offering a representative survey, the states of New York, California, Massachusetts and Connecticut have gathered statistics which show that the trend of the night automobile accident is definitely upward, according to a report from the General Electric Co.

From 1921 to 1934, night fatalities increased in Massachusetts from about 200 a year to 500, and if the present rate is maintained, it is estimated that 750 persons will meet their death in night accidents in 1945 in that state. During the same period, daytime auto deaths decreased. In Connecticut, there was an increase in night fatalities of 50 per cent from 1926 to 1935 although daytime fatalities decreased during this same period.

That adequate lighting will reduce the number of night accidents is shown by the fact that two of the four states mentioned have been able to cut night auto accidents almost in half on highway and thoroughfares which have been illuminated with modern lighting equipment.

Lighting on Bay Shore Boulevard, San Francisco, reduced night accidents 40 per cent after it was installed. Studies on two New Jersey roads, one lighted and one not, show that on the lighted roadway, two out of three accidents occurred during the day while most of the accidents occurred at night on the unlighted road. Schenectady County, N. Y., officials decreased night accidents 36 per cent when they had



The Albany-Schenectady, N. Y., Highway Lighted by Sodium Vapor Lights

highway lamps installed on the Troy-Schenectady road.

Night fatalities and accidents rose 2½ times when, as an economy measure, it was decided to discontinue lighting on the Mt. Vernon highway near Washington. The same thing occurred on the Saw Mill River and Hutchinson River Parkways in Westchester County, N. Y., where night accidents jumped

37 per cent when highway lighting was removed a few years ago.

These statistics prove that there is a definite relation between adequate highway lighting and night auto accidents and fatalities. While lighting is not the "cure-all," it can play a major part in reducing what is considered by the National Safety Council as today's most serious traffic safety problem.

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NO DEVICE  
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One man easily takes care of the entire installation of all joints and the units can be assembled on the sub-grade or alongside the job and placed under boom of the mixer at the right time,

avoiding all delay in operations. This new Wheeling unit is fabricated to accommodate the correct size of dowel bars and to support them at the required distance from the sub-grade or the finished surface of the pavement, and it is flexible enough to conform to the sub-grades of heavy edge pavements.

Send cross section, width of slab and total lineal feet of expansion and contraction joints... and quotations will be furnished by return mail.



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5980 South Boyle Avenue  
Los Angeles, California



## Flood Control Work Near Los Angeles

(Continued from page 20)

per. The reinforcing of the slab was particularly heavy because of the possibility of heavy upward thrust when the ground water reaches normal again, and further because the structure will eventually become the base for a through concrete highway to be constructed by the city.

Well-designed steel headers were used for holding the expansion joint material at the end of each 30-foot block. They consisted of a steel plate in sections 6 to 8 feet long to permit a combination that would fit any of the widths to be poured, along the top of which was welded an angle with a 1-inch leg to hold the expansion joint material. V-shaped copper sheets were attached to the bottom of the premoulded material to tie the sections together and prevent infiltration of the ground water below.

Vent tubes of 4-inch steel pipe were inserted in the outer sections of the invert leading to the central drains to remove water that accumulated outside the structure at the sides. These were spaced about 500 feet apart.

The operating crew on invert per shift included about twenty men working on grade, fifteen men on steel, five spading concrete and one vibrating the keys and wall sections. Ladders were located at frequent intervals along the banks to make it easy for the men to leave the work at lunch and quitting times without walking to a ramp which might be located several blocks away.

The invert and wall concrete were cured with asphaltic cut-back material sprayed on as soon as the water had disappeared from the surface of the invert or on the walls as soon as the forms were stripped.

The job was equipped with floodlights throughout to permit such work as was absolutely necessary to be performed after dark. Current purchased from the local utility was used with 250-watt lights in floodlight reflectors of the hooded type.

### The Wall Forms

The forms for the walls were built in panels 15 feet long and usually used with two panels as a unit. This was possible as the Loadmaster crane which placed and stripped the forms could just handle the heavy double section. The panels were 12 feet high which left the top 4 feet to be poured in the future with special forms. The form lumber was 2 x 6-inch tongue and groove material with 3 x 6-inch verticals and double 3 x 6-inch wales. Diagonal members from the two corners straight across the panels strengthened the forms, permitting handling without danger of getting them out of shape. Along the base of each panel was a set of 4 x 4-inch stringers acting as a base. The inner and outer forms were tied with Universal form clamps using 1/2-inch rods.

The wall sections were poured with a Ransome 13E paver delivering to a concrete hopper that was handled by an Osgood crane with Cummins diesel power. A special chute made to fit into the forms was used for placing the concrete. When it was necessary to pour at another location, the chute was attached to the bottom of the concrete hopper and they were moved as a unit.

When the walls were completed and ready for backfill an Osgood crane was run along the invert and with its 50-foot boom it handled a 1-yard clamshell bucket over the side of one wall and picked out the backfill material for behind the other wall. This unusual method was necessary where there was no right-of-way along one side of the channel for the tractors and bulldozers to use. In all other sections the bulldozers



C. & E. M. Photo

The Master Generator Unit

pushed the piled material into the hole against the wall.

### Concrete Batching

Both sand and gravel were purchased from a local producer and either stockpiled on platforms near the batching plant or delivered direct to the hoppers over the boots of the two bucket elevators leading to the bins over the Butler weighing batchers. When material was taken from stockpile it was loaded into a pair of trucks by two Barber-Greene loaders and hauled to the hoppers. The dry batches were hauled by a fleet of four or five 3-batch trucks, augmented by other hired trucks as needed.

The batching plant turned out about 600 yards of material a day with a maximum of 750 yards. It also batched about 90 yards a day for another job.

The cement in paper bags was delivered to a cement platform about 300 feet from the batchers where a crew of four men loaded the proper number of bags of cement onto each of the batches. The bags were emptied by three men onto the batches just before the trucks went down a ramp into the channel section.

### Labor and Hours

Most of the employees on this project were taken from the relief rolls and trained in their work. There was no evidence of dallying or stalling on the work when visited. Practically every man, and there were swarms of them on the various operations, was active and busily engaged in the task to which he had been allotted and trained. This project, with some others visited, open up the hope that the laborer has become interested in his task, as patience has been expended in training him to useful endeavor which may be somewhat different to that in which he earned his living before the crash of general construction activity in 1930.

There were three 7 1/2-hour shifts worked on this project, with a limit of 30 hours per week for any one man. The job was run every day except Sunday. The employment rolls show a total of 3,500 men on the job including the group working in the well-equipped yard where lumber was cut to the sizes needed, form panels made up and the various machine shops were located. The number of employees does not include the operators of rented equipment where an operator was furnished as a part of the rental agreement.

### Personnel

The Los Angeles Flood Control Projects of the U. S. Engineer Department are under the direct supervision of Major Theodore Wyman, Jr., District Engineer with headquarters in Los Angeles.

## Generator Furnishes Power for Concrete Vibrators

To furnish the power for its concrete vibrators, the Master Vibrator Co., Dayton, Ohio, manufactures a portable generator unit which can easily be moved about the job. The unit consists of a 2-hp Briggs & Stratton engine driving a 1-kva Master generator with a Morris chain type coupling connecting the two. The engine and generator set are mounted on a cast aluminum base, to which are attached two pipe handles. The unit is furnished with or without a pneumatic-tired wheel, as desired.

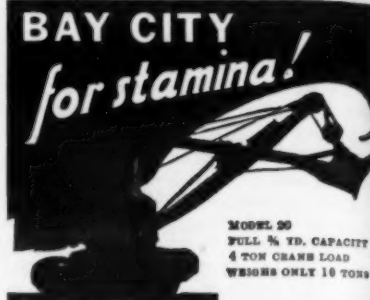
The generator is completely shielded for weather. It is of sturdy construction and the exciter for the generator, which is single phase and furnished in either 125 or 250 volts, 60 or 70 cycle, is built in the main armature and field, making a compact outfit. This unit furnishes power for the operation of the Master No. 1 and 2 concrete vibrators.

Similar units with larger generator capacities are also included in the line.

## Arizona Clears Shoulders As a Safety Measure

Arizona clears the shoulders of its highways with a blade grader so that there is no vegetation on the shoulders or in the drainage ditches. The reason for this apparent wanton destruction of vegetation in a country where there is none too much growth is that by clearing the shoulders, particularly in the open ranges or unfenced grazing areas, cattle and other grazing animals are kept away from the roadway by

eliminating the tempting green. Thus day and night the automobile driver is free of the threat of cattle wandering onto the edge of the traveled way and causing a rapidly moving vehicle to swerve and side swipe another car.



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1 1/4 yd.	43
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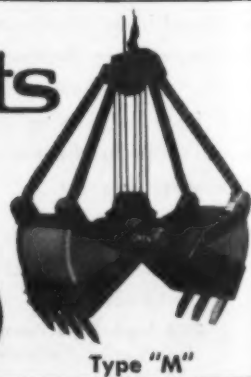
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# Oiled Gravel Roads At \$2,100 a Mile

By N. C. HUBBS,  
County Engineer, Marion County, Oregon

MARION County is the second largest county in population in the State of Oregon, and is in the heart of a large lumber industry, which increases heavy traffic, making it imperative that we oil our gravel roads to cut down maintenance costs and also to eliminate the dust menace.

## Preparation and Oiling

During the rainy winter months we carefully work our gravel roads with motor graders, shaping the crown and building up the weak spots with gravel. We also see that our roadway is properly drained. During the summer months, and after the roadway is well settled and dry, all loose gravel is graded to one side and all holes and uneven places are patched by the penetration method, bringing the surface to an even grade. It is very necessary to have a uniform subgrade in order to obtain a smooth finished surface. After this is finished, the surface is swept clean by a power broom.

When the base has been prepared and made clean in this manner, hot bituminous cement, No. 3 road oil, at a temperature from 350 to 450 degrees F., is spread over the base at the rate of 0.25-gallon per square yard. While the cement is still hot a layer of 1 1/4 to 3/4-inch screenings is spread upon the hot base at the rate of .022-cubic yard per square yard. After spreading the screenings, the surface is smoothed with a power grader. While smoothing is in progress additional screenings are added by hand wherever necessary to insure complete cover and uniform thickness. This course is then thoroughly rolled with a 10-ton roller.

The second course consists of spreading No. 3 hot road oil, 0.30-gallon per square yard, followed by spreading 3/4 to 1 1/2-inch screenings at the rate of 0.009 cubic yard per square yard. The method of construction is the same as the first course.

Following the application of the second course a seal coat is applied as follows: all loose screenings and dust are swept from the surface of the treated materials. Hot bituminous cement is then applied at the rate of 0.25-gallon per square yard, and while this cement is still hot, coarse 1/2 to 3/4-inch screenings are spread at the rate of 0.006-cubic yard per square yard. The surface is then broomed and rolled until well compacted, and a uniform texture throughout, after which fine screenings, 3/4-inch to 0, are applied at the rate of 0.003-cubic yard per square yard, and the surface again thoroughly rolled and broomed.

After the first seal coat has been applied the roadway is subjected to traffic for a period of about two weeks, after which the surface is swept clean and free of dust.

Following this we spread an application of emulsified asphalt, or heavy cut-back asphalt, the rate of spread being

## Careful Methods Backed by Planned Financing Provide Roads for Heavy Traffic in Lumber Area

0.25-gallon per square yard. This is followed immediately by screenings spread at the rate of 0.006-cubic yard per square yard. The surface is then broomed and rolled until the aggregate is absorbed and surface well compacted. Then a final layer of screenings, 1/4-inch to 0, is applied at the rate of 0.004-cubic yard per square yard and the surface again rolled and broomed.

We lay an 18-foot oiled surface with a 4-foot gravel shoulder on either side. And in order to maintain traffic during

the construction, we lay one-half of the roadway at a time, diverting traffic over the other half of the road by means of a pilot car.

## Equipment

As our shops are located adjacent to the S. P. tracks, we have our own spur and 10,000-gallon storage tank, with heating coils. The heating and distributing of the asphalt is done from this point.

Other equipment used by the county consists of: one retort and boiler, one Austin-Western motor grader, one Adams motor grader, two 10-ton rollers, two truck tenders with 1,000-gallon tanks for transporting hot oil, one power broom, one service truck, one Austin-Western portable rock crusher, one Austin Badger shovel with transport truck, one Gerlinger distributor, and one Gerlinger oil burner patching outfit.

## Costs

During 1935 we laid 21 1/2 miles at an average cost of \$2,100.00 per mile. In

1936 we expect to double this mileage. These programs are financed by setting aside a certain sum each year for oiling.

There is more to safety than road and highway construction, said Major Hugh Lumsden, Wentworth County Engineer, Ont. What is needed is education, beginning in the schools, as to how to be a good, sane and sensible pedestrian as well as a good motor driver.



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# GOHI

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# CORRUGATED PIPE

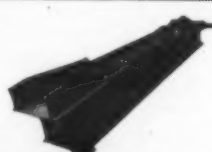
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## Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

### A Heavy-Duty Truck Shovel

809 The Quick-Way Truck Shovel Co., 42nd & Josephine Sts., Denver, Colo., will be glad to send to interested contractors its literature on the Quick-Way shovel, a specially-designed, light-weight heavy-duty power shovel for mounting on any 3½ to 5-ton truck.

### Tar and Asphalt Kettles

810 Circular No. 27-A issued by the White Manufacturing Co., Elkhart, Ind., describes in detail the various models of White fire-proof tar and asphalt heating kettles as well as White kerosene torches. A copy of this circular may be secured on request.

### Hoists in 2, 5, and 15-ton Sizes

811 Complete information on Beebe all steel hand hoists which are now available in 2, 5 and 15-ton sizes, features of which are the patent gear change and positive internal brake, may be secured direct from Beebe Bros., 2724 Sixth Ave., So., Seattle, Wash.

### Drill Rigs for Tough Jobs

812 Cleveland Rock Drill Co., 3736 E. 78th St., Cleveland, Ohio, will be glad to send bulletins 109 and 111 describing the Cleveland WDA-10 drill rig and the type of work it will do, as well as to suggest how it will help to solve individual contractor's problems if they will send them the details of their jobs.

### Trailbuilders for 30 to 95-Hp Tractors

813 LeTourneau Angledozer, which are rugged versatile Trailbuilders made in sizes to fit tractors of from 30 to 95 horsepower, are described and illustrated in a new booklet which may be secured free from R. G. LeTourneau, Inc., Peoria, Ill., or Stockton, Calif.

### Tandem-Drive Speed Patrols

814 The new Allis-Chalmers tandem-drive motor patrol graders in two models with a number of exclusive features are described in a new bulletin which the Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee, Wis., will be glad to send on request.

### Equipment for Contractors

815 Worthington equipment for the contractor, including portable air compressors, rock drills and air tools of various kinds are illustrated and described in a new booklet WP-1091A which may be secured upon request from the Worthington Pump & Machinery Corp., Harrison, N. J.

### Portable Asphalt Plants

816 Hetherington & Berner portable asphalt plants, for hot or cold mix, which provide accurate control of materials to comply with any standard specifications for bituminous mixes, are described in Bulletin T-248 which may be secured direct from Hetherington & Berner, Inc., Indianapolis, Ind.

### Keep Your Roads Clear All Winter

817 If you install a well-built snow fence properly, you won't have to buck heavy snow drifts on your highways this coming winter. The Rowe Mfg. Co., Galesburg, Ill., will be glad to send you its literature on Rowe "Can't-Drift" snow fence which costs but little, is quickly put up and taken down, is easily moved and stored and lasts for years.

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### Contractor's Lighting Plant

818 Complete information on the Victor 1,000-watt 32-volt self-starting electric lighting plant for use with or without storage batteries may be secured by those interested from the Victor Manufacturing Co., Box 76, Adrian, Mich.

### Scraper for Dirt Moving

819 The Heil Dig-N-Carry scraper, with a 10 to 12-yard capacity, for heavy dirt moving jobs is described and illustrated in a new folder which the Heil Co., 3000 W. Montana St., Milwaukee, Wis., will send to interested contractors and engineers on request.

### A Balanced Power Hoist

820 The Burch balanced power hoist for dump truck bodies of 1½ and 2-yard capacities, a feature of which is only one moving part, is described in literature which may be secured upon request from the Burch Corp., Dept. M, Crestline, Ohio.

### Road Rollers of 6 to 15 Tons

821 Hercules road rollers in 6, 7, 8, 10, 12 and 15-ton sizes are described and illustrated in literature which interested contractors may secure from the Hercules Co., Marion, Ohio, by mentioning this magazine.

### A ¾-Yard Shovel

822 Bucyrus-Erie Co., South Milwaukee, Wis., will be glad to send to interested contractors complete information on the Bucyrus-Erie 10-B ¾-yard shovels and records of its performances on the job.

### Wellpoint Systems

823 The Complete Machinery & Equipment Co., Inc., Dept. C, 36-40 11th St., Long Island City, N. Y., will be glad to send on request job estimates and literature describing its Complete wellpoint system for drying up any excavation.

### A New Bituminous Distributor

824 The new Etnyre bituminous distributor with a circulating, non-drip spray bar, is described and illustrated in literature which E. D. Etnyre & Co., 400 Jefferson St., Oregon, Ill., will be glad to send to interested contractors and state and county highway officials.

### Give a Thought to Snow Removal

825 Baker snow plows for motor trucks and tractors which have the Baker patent sectional tripping blades on truck blade plows, have scientific curvature, positive lift, both power and hand hydraulic, and sturdy, simple mounting, are described in the literature of the Baker Manufacturing Co., 565 Stanford Ave., Springfield, Ill.

### Asphalt Products for Road Work

826 Specifications and other data on Socoy asphalt and road oils for the construction and maintenance of sheet asphalt paving, surface treatment, penetration macadam, asphaltic concrete and road and plant-mix, may be secured by interested contractors and engineers from Socoy-Vacuum Oil Co., Standard Oil of New York Division, 26 Broadway, New York City.

### A New ¾-Yard Shovel

827 The new P & H Pacemaker Model 33 ¾-yard shovel, features of which are in tractor-type crawlers, all-welded frame, smooth-running helical gears in all hoist mechanism and live roller circle with hook rollers for easy swing without tipping strains, is described in a new Bulletin X-10 which may be secured from Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis.

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**New Automatic Control for Shovels**

828 The new Speed-o-Matic power control which is now available on a number of Link-Belt shovel-crane-draglines is described and illustrated in a new folder which the Link-Belt Co., 300 W. Pershing Road, Chicago, Ill., will be glad to send on request.

**Complete Line of Road Machinery**

829 Complete information on the Galion line of road building machinery, including motor and pull-type graders, rollers, drags, spreaders, planers and rooters, which are in use all over the world on road construction and maintenance, may be secured by those interested from the Galion Iron Works & Mfg. Co., Galion, Ohio.

**2 to 8-Inch Self-Priming Pumps**

830 A copy of the Sterling combined pump catalog and valuable bulletin of engineering data may be secured without obligation from the Sterling Machinery Corp., 411-15 Southwest Blvd., Kansas City, Mo., manufacturer of 2 to 8-inch self-priming centrifugal pumps.

**Good Roads at Low Cost**

831 Complete information on the use of Tarvia in the construction of low cost roads may be secured by those interested from the Barrett Co., 40 Rector St., New York City. This company also maintains a Technical Service Bureau with a trained staff who invite your consultation, without cost or obligation.

**Handling Concrete by Pump and Pipeline**

832 Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., will be glad to send to interested contractors and engineers complete information on its Pumpcrete system of handling concrete by pump and pipeline from the mixer to the forms.

**Air-Operated Vibrators**

833 Munsell air-operated vibrators for all classes of concrete construction, including bridge deck slabs, dams and locks, highway pavement and concrete products, are described in literature which may be secured from Munsell Concrete Vibrators, 997 West Side Ave., Jersey City, N. J.

**Chain Crowd Feature of Shovel**

834 Complete information on Koehring shovels, a feature of which is the chain crowd, a continuous single chain traveling inside the boom which maintains the chain tension automatically regardless of boom movement, may be secured by those interested from the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis.

**Surface Material Spreader**

835 Complete details and operation data on the Buckeye surface material spreader which lays down quantities up to 60 pounds per square yard under positive control, may be secured by contractors and state and county highway officials direct from the Buckeye Traction Ditcher Co., Findlay, Ohio.

**Paving Hand Tools**

836 Giantgrip hand tools for paving, including straight-edges, hand floats, longitudinal floats and concrete brooms, are described and illustrated in a new folder which interested contractors and engineers may secure direct from the L & M Manufacturing Co., 10302 Berea Road, Cleveland, Ohio.

**New Booklet on Truck Shovel**

837 Many on-the-job photographs showing the Michigan truck shovel in use as a shovel, crane, dragline, and trench hoe, together with descriptions and specifications, are contained in the new Bulletin C which the Michigan Power Shovel Co., Benton Harbor, Mich., will be glad to send on request.

**Side Suction Pumps**

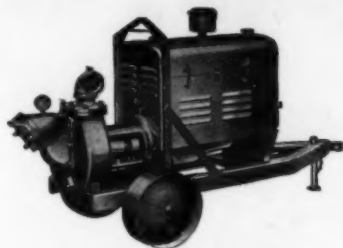
838 Byron Jackson Bilton pumps, in which the pump and motor are constructed as a single unit without flexible coupling or base plate, for use as a general utility unit, are described in Bulletin No. 360-B which may be secured direct from the Byron Jackson Co., Berkeley, Calif.

**Story of Manganese Steel**

839 This is the title of a new folder describing the development of manganese steel and its various uses for construction equipment which may be secured by those interested direct from the American Manganese Steel Co., Chicago Heights, Ill.

**Tank Car Heaters**

840 Cleaver tank car heaters in one, two and three-car sizes and bituminous boosters, also in three sizes, are described and illustrated in a new catalog which the Cleaver-Brooks Co., Milwaukee, Wis., will send on request.



The New Model 40M Pump

**New Line of Centrifugals Announced by Sterling**

A new line of self-priming centrifugal pumps of advanced design, ranging in size from 2 to 8-inch and with capacities in accordance with the standardized ratings of the Contractors Pump Manufacturers Association, has been announced by the Sterling Machinery Corp., 411 Southwest Blvd., Kansas City, Mo.

Features of these new pumps are larger pump cases, quicker priming action, built-in check valves, double grease seal, rugged, sturdy construction and the absence of gadgets and settling tanks.

An innovation has been made by this company in the construction of its new 4-inch Model 40M pump, the 6-inch 75M and the 8-inch 125M. All of these have the impellers mounted on a sturdy shaft supported by two heavy-duty ball bearings which is driven from the engine by a heavy-duty flexible coupling of improved design. The support bracket for the pump is bolted to the engine to assure permanent alignment.

**Argentine Roads Planned To Meet Traffic Needs**

A significant feature of the Argentine federal highway construction program, for which 300,000,000 pesos have recently been allocated under the fifteen-year program authorized in 1932, is the very small mileage of roads which obtain heavy traffic. According to a study made recently, there were only 434.98 miles which could expect a daily traffic of more than 300 vehicles; 8,699.6 miles with a daily traffic between 50 and 300 vehicles; and 19,263.4 miles of roads with less than 50 vehicles a day.

Accepting the criterion that a high-cost road is justified only if the daily traffic exceeds 1,500 vehicles, the Argentine National Highway Bureau anticipates that the largest proportion of its system will need to be dirt roads only,

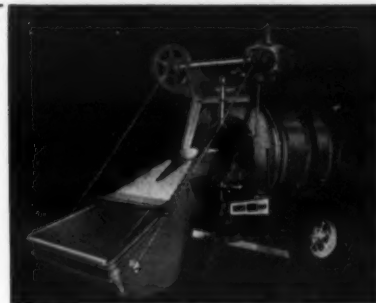
which are to be built or improved at a very low cost. The estimates for its program are very low compared with those of the United States or many other countries, but with the light traffic on the roads, the National Highway Bureau believes that its program of road and bridge construction can be carried out at the low estimates.

All road contracts are awarded to the lowest bidders and with the keen competition existing between the road contractors in the Argentine, there is no doubt that the National Highway Bureau is obtaining work at a very low figure, according to a recent report from the U. S. Bureau of Foreign and Domestic Commerce on which this article is based. Furthermore, contractors are eager to bid on federal contracts because they obtain payment promptly, whereas on many provincial contracts 10 to 15 years elapse before full payment is realized.

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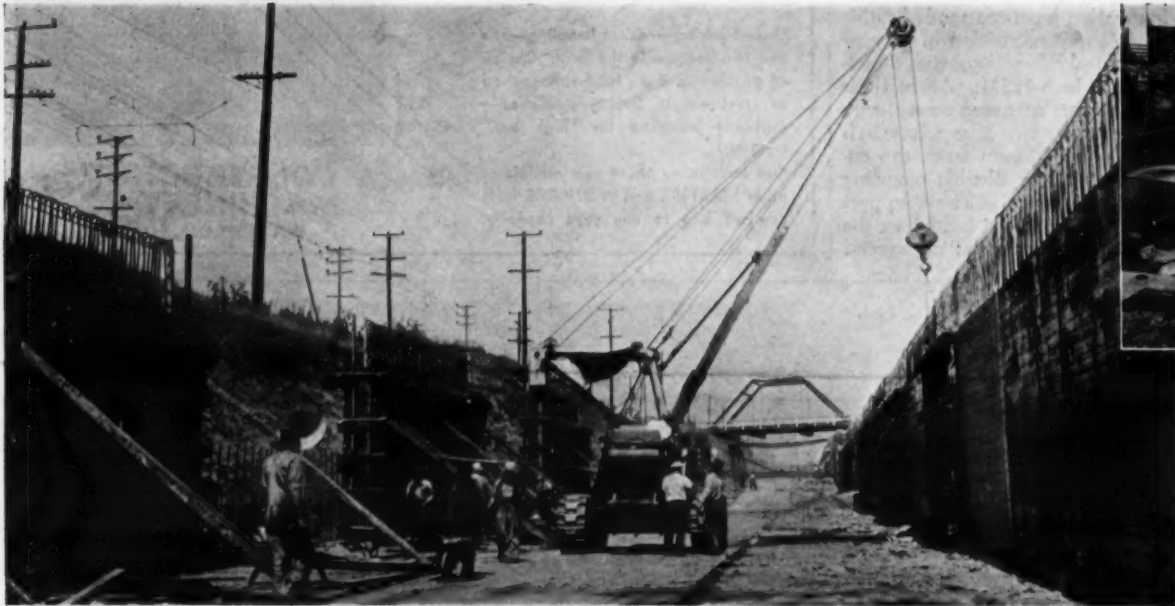
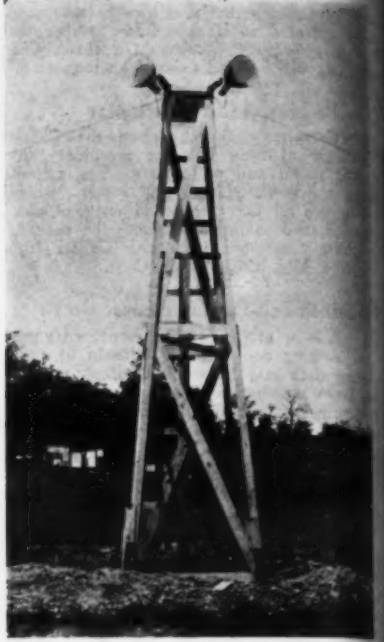
Write Rogers Bros. Corp., Albion, Pa., for Catalog No. 633

# Contractors and Engineers Monthly



C. & E. M. Photos

Grading a Major Cut-Off Near Fairmont, W. Va., Where Ralph W. Fimple Has Just Completed a \$150,000 Contract on U. S. 119. Above, In the Background, Is One Of the Two Cuts from Which Material Was Taken for the 40,000-Yard Fill in the Foreground. Left, a Light-Weight Slope Board with a String Level at the Top Aided the Green Laborers in Making a Neat 1 to 1 Slope. Right, One of the Wooden Flood-light Towers. See Page 26.



C. & E. M. Photos

Ballona Creek Project in Los Angeles Is One of Three Large Relief Labor Flood Control Projects Now in Progress Under the Direction of the United States Engineer Corps. Left, a Loadmaster Crane Stripping Form Panels from the Walls, and Other Sections of Wall Ready to Pour. Above, an Osgood Crane, Running within the Completed Channel, Reached Over One Side for Backfill Which It Deposited Behind the Opposite Wall. See Page 1.



C. & E. M. Photo

The Neat High-Speed Welding Trailer Developed by Earl Estep, Chief Mechanic for the New Mexico Construction Co. See Page 8.



Bureau of Public Roads Photo

A Striking Picture of Vertical-Slat Snow Fence at the Top of Berthoud Pass, Colorado, Showing Its Effectiveness in Keeping High Drifts Off This Highway. See Page 1.



Creating Beauty Spots at Highway Junctions in the Cactus Desert Section of Arizona. Left, "Handle Her Easy, Boys! She's Only 250 Years Old!" A Giant Saguaro Being Transplanted at Florence Junction, Shown at the Right, 30 Miles from the Place Where It Had Spent Its Youth. See Page 29.